THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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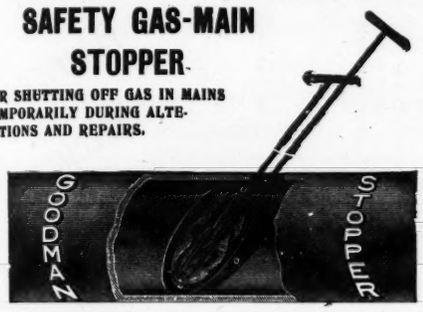

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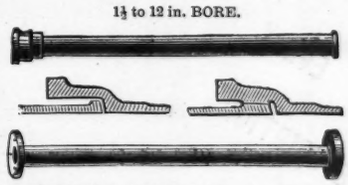

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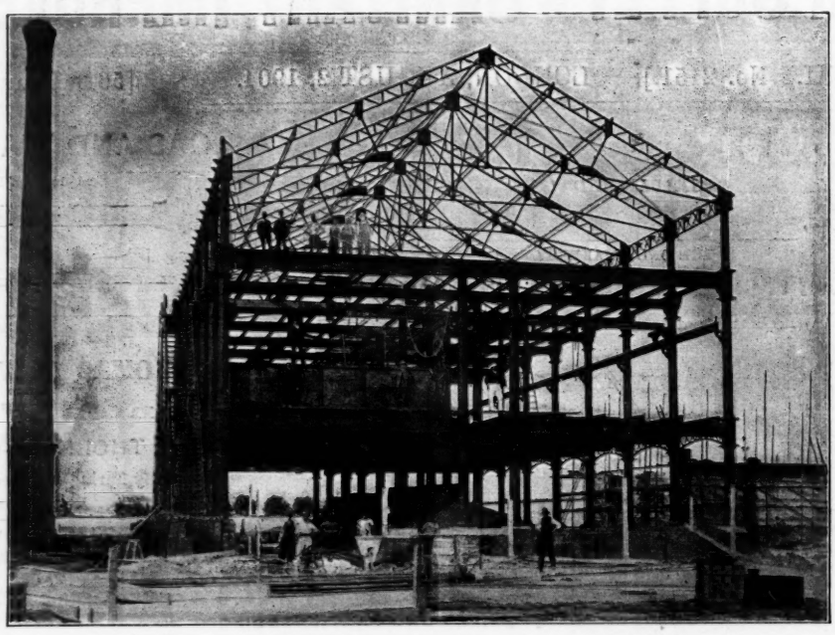

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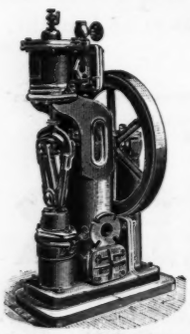

Fig. 705. "SINGLE RAM" STEAM-PUMP.

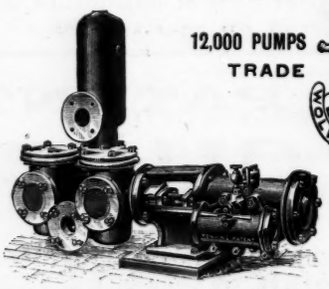

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

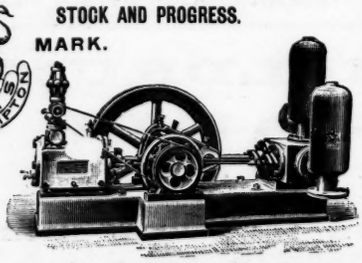

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

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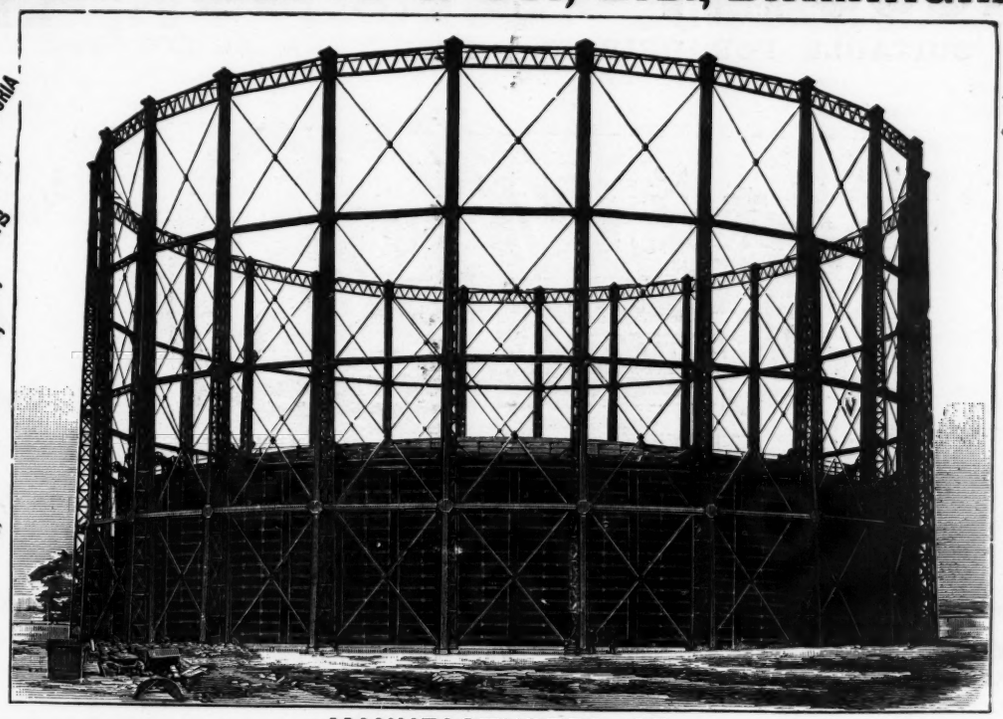

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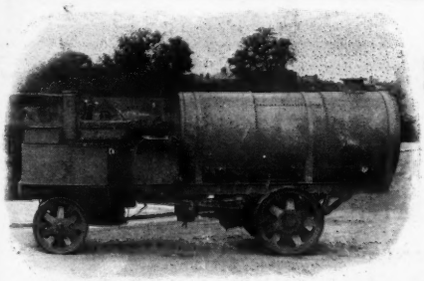

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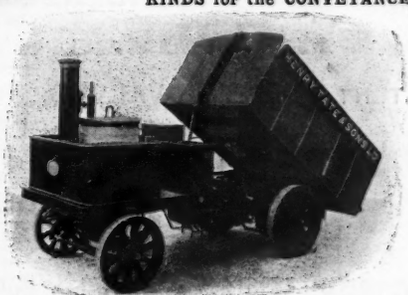

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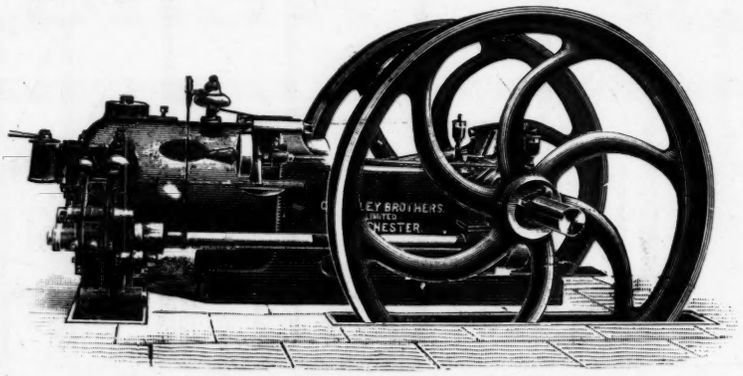

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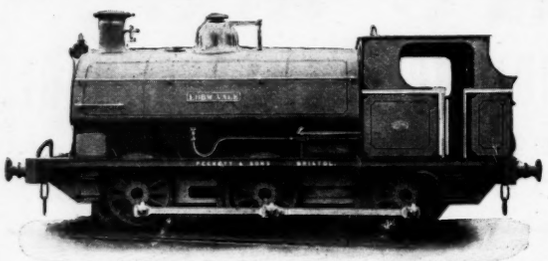

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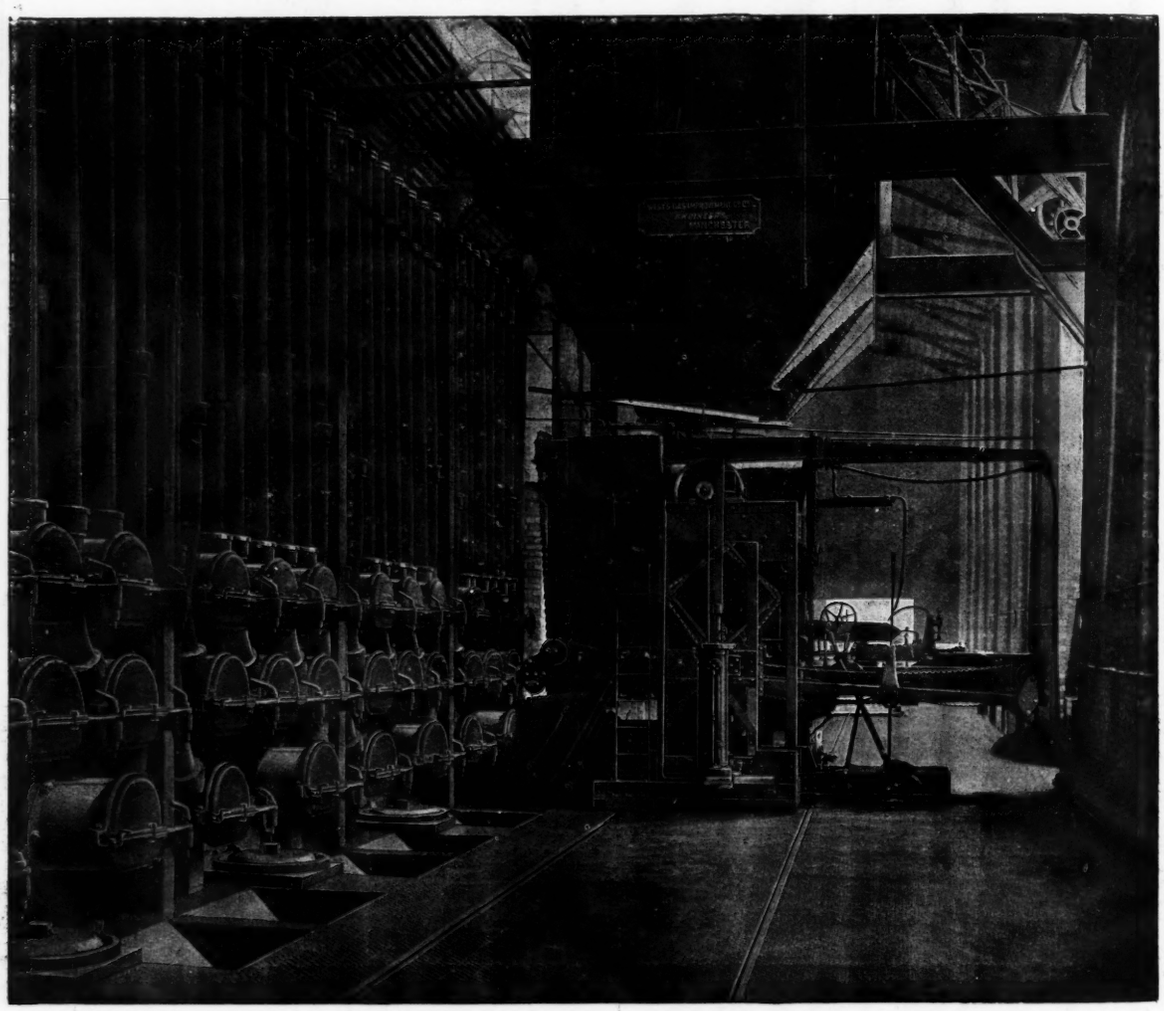

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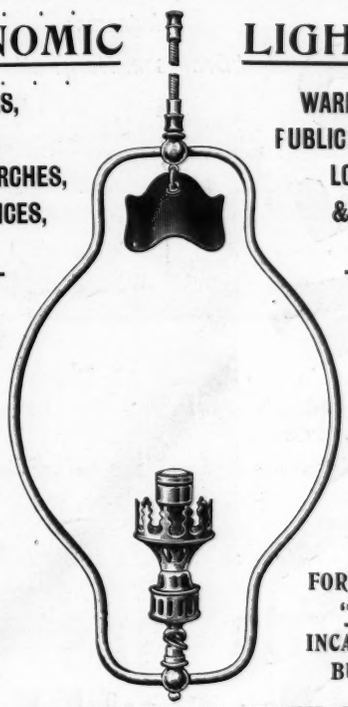

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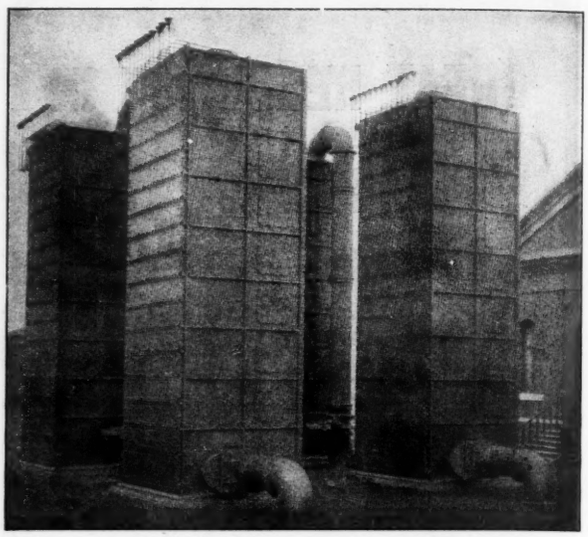

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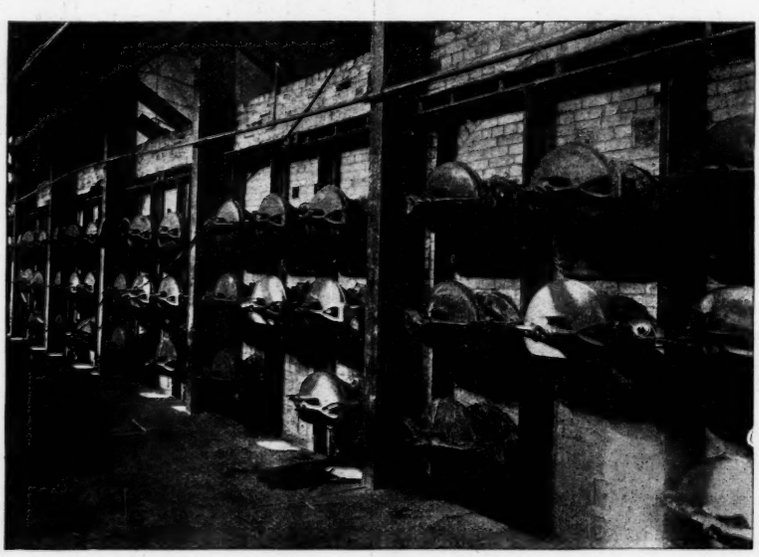

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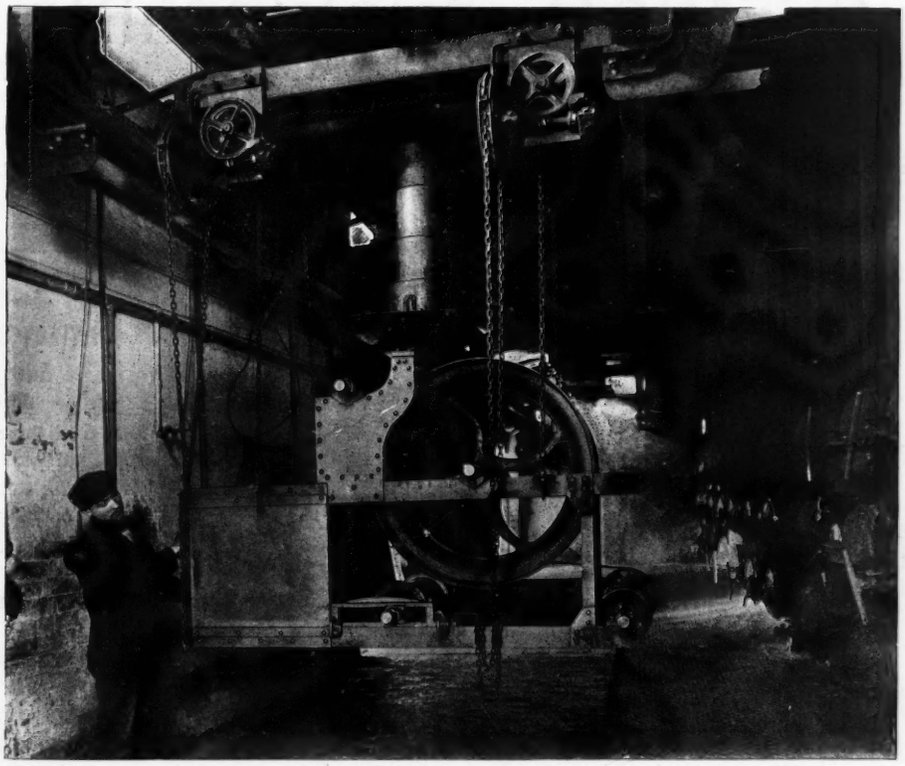

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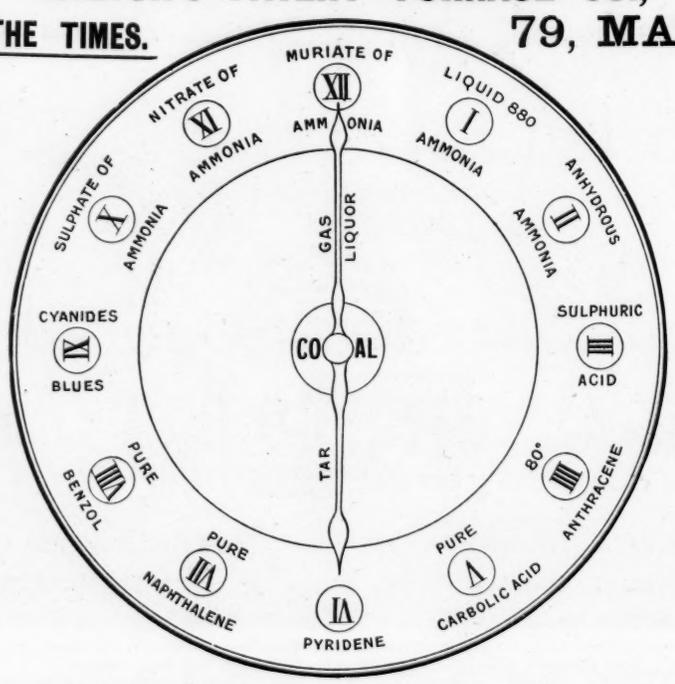

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EDITORIAL NOTES—GAS, &c.

The Report and Accounts of the Gaslight and Coke Company.

THE report and statement of accounts which the Directors will submit to the shareholders of this Company at the half-yearly meeting next Friday, are more satisfactory than any that have been issued for a long time, though hardly so much, as regards the report, for what is said as for what has not had to be said. The Directors have now no ignominious parliamentary defeat to record; no stern reminder of some long-neglected duty. They have been given a fresh start with a clean slate; and it is for them to make the best of it they can. First and foremost, the Company are to be congratulated upon an increase of 3·45 per cent. in the sales of gas during the half year over the quantity sold during the corresponding period of 1903. This brings up the total to 10,641,483,000 cubic feet, which is, however, slightly less than the quantity sold during the corresponding half of 1898—six years ago; showing that the Company's business has made no progress in this period. But for an increase to occur after the series of decreases which has marked the Company's career during the last few years, indicates that the corner has at last been turned.

The Directors express satisfaction, "on the whole," with the recommendations of the Departmental Committee of the Board of Trade on Metropolitan Gas Testing, though it may be noted that these do not in any way affect that which the Governor, in his speech at the last half-yearly meeting, declared to be the main point of his Company's case—namely, that "under the present system, we do not get "credit for the full illuminating power of the gas we "supply." It may be asked with some pertinence why, having a grievance in this respect which is left unredressed by the recommendations, the Directors should have so expressed themselves, particularly as on this very point the recommendations involve (as regards nomenclature) a rank injustice to the gases supplied by the other two Metropolitan Companies. More strange still is that which follows on the same subject. "Particularly welcome," say the Directors, "is a proposal to grant some much-needed relief from "the unnecessarily stringent regulations with regard to "sulphur purification under which the Metropolitan Gas "Companies have been compelled to carry on their business "in the past." No doubt. We have no quarrel at all with the Directors for thus giving vent to their feelings of relief. But why did not the Governor mention this in February last as one of the objects of the Company in preparing their case; and why did he say, at the preceding half-yearly meeting, "Let it be understood . . . . we "are not seeking to supply an inferior or less pure illuminant. This would be folly in these days of competition "with the electric light." If it appeared like "folly" at that time to allow a few more grains of sulphur in the gas, what does it seem like now, when the Company are apparently within measurable distance of obtaining that relief for which others have for so long a time been agitating? It is, however, "never too late to mend;" and we may leave the Governor to settle this somewhat delicate matter with his advisers.

The statement of accounts speaks for itself. The revenue account shows a decrease of about £23,000 in the cost of coal and oil, but an increase of almost a like amount in repairs and maintenance of mains and service-pipes; the total expenditure being £8605 in excess of that of the corresponding half of 1903. On the opposite side of the account, the sale of gas has brought in an additional revenue of about £32,000; rental of stoves, £3000; sale of coke, £22,000; ammoniacal liquor and sulphate of ammonia, £15,000. On the other hand, tar and tar products have realized £5000 less. The result of these additions to the income, *minus* the increase in outgoings, is an increase of net revenue of about £58,000; bringing up the balance of this, including the amount carried forward, to £619,326. From this has to be deducted the first instalment of £10,000, for the redemption of obsolete capital under the provisions of the Company's Act of last year; leaving the sum of £609,326 applicable for dividend. How this is to be disposed of has already been made known. The Directors recommend a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, which will absorb £335,350; leaving the sum of £273,975 to be carried forward. This compares with the same rate of dividend paid for the corresponding half of 1903, when the amount carried forward was only £116,530. This improved position of affairs has enabled the Company, as intimated last week, to reduce the price of gas by 1d. per 1000 cubic feet; and we may conclude these observations by expressing the hope that the Directors may be in a position to follow this up by a further reduction at no very distant date.

The Sulphate of Ammonia Committee.

THERE is an exceptionally gratifying feature about the report of the Executive Committee of the Sulphate of Ammonia Committee upon their work for the year ending June 30; and it is that the special efforts which have been made to secure new subscribers has resulted in the netting of 45 additional members, representing in the aggregate about 6000 tons of sulphate of ammonia. This, with the increase in the output of sulphate of ammonia, accounts for a respectable addition to the subscription for the year. This is calculated at the rate of 5d. per ton; and the quantity of sulphate of ammonia on which it was paid last year was 128,550 tons, compared with 119,739 tons in the year ending June 30, 1903. Thus there was an increase of 8811 tons. There is every reason to be pleased with this augmentation in the support of the Committee in their work of promulgating among agriculturists a knowledge of the efficiency of sulphate of ammonia as a fertilizer; but there is much yet to be done in obtaining the co-operation of the remaining makers, who, of course, all benefit from the labours of the Committee. If the review of Messrs. Bradbury and Hirsch of the sulphate of ammonia market for last year is consulted, it will be seen that their estimate of the production of sulphate of ammonia from all sources in 1903 is 234,000 tons, of which gas-works produced 152,000 tons, iron-works 18,000 tons, shale works 37,500 tons, and coke and carbonizing works and producer gas 26,500 tons. The difference between this production of 234,000 tons and the quantity on which subscriptions were paid to the Committee last year is 105,450 tons; so that there are sulphate of ammonia makers representing rather more than half of the production of the kingdom who contribute their quota to the prosecution of the very effective work carried on by the Committee, while the large remainder continue to enjoy the fruits of the Committee's militancy without incurring any of the expense.

It would, of course, be difficult to take the price of sulphate of ammonia to-day or at any other period, and assert that of it so much is due to the action of the Committee; but it is fair to argue that, without their work, the price now ruling would not have obtained, nor would the prices that have ruled in the past been at an equal level had there been no Committee to cultivate the use of sulphate in opposition to the powerful and active operations of the nitrate of soda combination. The Committee are not going to relax their efforts to obtain more new subscribers; and we believe the Chairman (Mr. W. G. Blagden) intends to personally look after those makers who are not yet subscribers. We hope he will be fortunate in securing their allegiance to the cause. The Committee include all sulphate of ammonia makers, no matter to what branch of industry they may belong; and therefore, on the figures we have given, it must be there are many gas-works still holding aloof. Without desiring to be querulous over this matter of financial support to the outer and necessary work of the gas industry, a peg must be put in whenever opportune. It is difficult to know why so many gas undertakings (unless

parsimony is at the root) withhold their support to the organizations now working in the defence of the interests of the industry. Gas engineers and managers support the technical work of the industry; but all things considered, there is far from being a large amount of encouragement given (through the channel of financial aid), by those whom they serve, to work which must be carried on assiduously if the industry is not to suffer. We hope the fresh endeavours that are to be made to lengthen the list of subscribers to the work of the Committee will result in the names of all makers being enrolled. This is expecting much; but we cannot see why it should not come to pass, so that everybody who benefits pays his share of the cost of securing and maintaining the benefit.

The North British Association Meeting.

It would possibly be wide of the mark to say that the meeting of the North British Association of Gas Managers which was held in Glasgow last Thursday, will be looked back upon as one of the outstanding meetings which the Association have held during the forty-three years of their existence. There was nothing upon which the finger could be put with the remark that "this is notable." But, that being so, it is as equally true that it was a meeting of a high general quality. Meetings come and go; and the talk is ever of the same sort—of work accomplished and difficulties overcome, with more or less ingenuity. The process of evolution is slow; and it is not every day or year that the world is aroused with the announcement of something hitherto hidden having been revealed. But between the great mountain-tops of discovery there lie vast fields in which the careful worker and the patient observer lets his intellect out to industry, and garners results which can be seen and handled, and which suffice to carry the world on for a season. Of such a character was the meeting last week. There were but three technical papers before the members. The first, by Mr. W. Ewing, of Greenock, dwelt only with affairs in the retort-house. The second, by Mr. J. W. Napier, of Alloa, was a treatise upon the relationship of lighting and heating in gas. The third, by Mr. J. Napier Myers, of Saltcoats, was an analytical account of how to detect when leakage takes place, which is, of course, the first step towards the remedying of any defect.

Strange it is that Mr. Ewing's paper, which was the most controversial of the three, should have evoked the least response from the members. Yet so it was. That it was carefully prepared, and contained no contention which was not supported, will be seen by reference to the paper itself. Perhaps Mr. Ewing proved his case so fully that it was felt his conclusions could not be called in question; perhaps there was nobody present who had an interest to criticize them; or perhaps those who were present thought it advisable to keep their own counsel upon the subject of machine stoking, in which there is at present so rapid a development. Mr. Napier's paper received a great deal more attention. The subject is one that is scarcely yet in the world, far less out of it, whether as regards the scientific or the practical side. The scientific aspect weighed most with Mr. Napier; the members who took part in the discussion leant more to the practical. Mr. Napier is desirous of conducting a thorough—a laborious—research into the nature and properties of every coal, so that managers should, as was said of Moltke, simply have to open a particular drawer and they would find there an infallible scheme for the compilation of their yearly contracts. A happy thought—one which would, doubtless, if it were carried into practice, be a great convenience to gas managers, but which, it may be pointed out, could never be quite complete or reliable, because of the constantly varying character of the coal, even from the same pit. But, notwithstanding this drawback, there is much room for the research Mr. Napier would like to undertake, and which the Association, having a fund for such purposes, might do worse than allow him to proceed with. The members were more concerned with the problem of how, with the materials and helps at their command, they could satisfy their customers and promote their businesses—to what extent, as matter of fact, they should supply high or low grade gas. This question, in Scotland, would a few years ago have been easily settled. But even in Scotland they have travelled rapidly "on the down-grade;" and on Thursday, there being no one to champion high-grade gas, the question became one of how far down they were to go, and not whether they were to go down at all. On this subject, the remarks of the President were most pregnant. Apart from the question of advisability, there is need for caution before making any violent change; so that, in the desire to improve the position of the gas undertaking, the consumers should not suffer. The consumer is the backbone of the undertaking; and changes effected without his goodwill would be disastrous. Mr. Myers never opens his mouth in public, or puts his pen to paper, without saying or writing something which is worthy of attention. On the subject with which he regaled the Association this time, he veritably laid himself all over his distribution system, and stethoscoped it, with a view to finding out where it was sickly. Such a method of dealing with leakage is unique. It is also sensible. Doubtless, if others should be sufficiently painstaking to follow Mr. Myers' example, it would also be found to be profitable to an extent which would give rise to wonder that it was never thought of before.

Among the subjects of general interest which were dealt with was the decision of the Committee of the Association not to affiliate with the Institution of Gas Engineers. It was almost a certainty that the decision of the Committee should have been challenged. That it was to be final, should never have been accepted; and while leaving aside the wisdom or unwisdom of their decision, it is a reasonable view to take that they might have formally submitted it to the members on Thursday, and allowed them to say "Yes" or "No," and let the world know why they said the one or the other. The Committee were chary of giving reasons for their decision. A spirit of independence seems to have been the chief one. They are not to affiliate, because they are a National and not a District Association. That they would have lost the national character by affiliating is not very clear, because they were not asked to amalgamate. That they have resolved to stand out, is their business alone. But while, as a Scottish Association, they cannot join the Institution, as Scotsmen they have no objection to fraternizing with their brethren in England, for many of them are members of the Institution. It is, therefore, not nationality which keeps them out, and it is not a want of community of interests; for now that, in Scotland, high-grade gas has been virtually given up, the same problems affect managers in the North as in the South. We are, therefore, driven back to the conclusion that the North British Association have not joined the Institution because they will not; but that, while they take up this position, they have no objection to lending a helping hand now and then in carrying on general work in the South.

The Exeter Rating Appeal.

The appeal of the Exeter Gaslight and Coke Company against the assessments of their undertaking in the parishes of Exeter and St. Thomas, has resulted, as reported in last week's "Journal," in a victory for the Company, although it can hardly be described as a substantial one. The circumstances of the case are somewhat peculiar, and reveal some of the inconveniences occasioned by the retention, without alteration according to the circumstances of the times, of the antique territorial division of the country into parishes. What is at the present day known as Exeter is situated in two (or, to speak more properly, three) parishes—namely, those of Exeter, St. Thomas, and Heavitree. The latter, however, took no part in the proceedings which have just terminated by the deliverance of the judgment of the learned Recorder for Exeter. By far the greatest part of the Company's gas—nearly 80 per cent., in fact—is consumed within the parish of Exeter; the proportion consumed in the parishes of St. Thomas and Heavitree being 11·50 and 9·66 per cent. respectively. Within the parish of Exeter, also, are situated the offices, show-rooms, and workshops of the Company—an excellent and convenient block of buildings, which must have been the admiration of many of Mr. Padfield's *confrères* who have visited Exeter, either on business or on pleasure bent—for is not Exeter the starting-place of the tourist in the West?—and perhaps the envy of not a few whose Directors cannot be induced to take the same broad view of their obligations and opportunities as those of the Exeter Gas Company. The rating of these buildings was not in dispute, and remains at the agreed figure of £255. The manufacturing works of the Company, however, are situated in the parish of St. Thomas, across the river which separates this parish from that of

Exeter; and it is in consequence of this that the dispute now under notice arose.

For many years the Gas Company have paid rates to the parish of Exeter representing a very large proportion of the entire value of the undertaking; and they were content to do so, as long as the total rateable value assessed upon by the three parishes did not appear to them to be excessive. Disputes, of course, did from time to time arise, but they were found to be capable of adjustment. The works at St. Thomas, however, grew apace; and in process of time they attracted the attention of the valuer for the parish, who, somewhat after the nature of these gentlemen, put upon them a value which was an awakener to the Gas Company. As stated by Mr. Ryde at the hearing of the appeal in April, the rate in St. Thomas was formerly £1475, covering works, mains, &c., which was increased by sundry small ratings to a total of £1529. In Exeter it was £3500, to which was added £255 for the offices—making a total of £3755; the mains in Heavitree being put down at £177. The rateable value for the three parishes was thus £5461. Last year the rateable value of the works and mains in St. Thomas was raised to £3800, with sundry small ratings amounting to £58; while the amounts for Exeter and the offices remained unaltered. Thus the total valuation of the undertaking was increased from £5461 to £7791, by the addition of something like £2300 to the rating of the works and mains in St. Thomas.

Regarding the undertaking as a whole, there was no justification for this addition; and the Assessment Committee of the parish of Exeter showed their appreciation of the position by offering to reduce their portion of the assessment to a total of £2505, instead of £3755. But, in order to support even this reduced figure, the witnesses for Exeter, as was pointed out by the learned Recorder when delivering judgment, found it necessary (1) to assume the amount actually paid in dividend, interest, and Directors' fees in 1902 as equivalent to the "net receipts," and (2) to assume that two-thirds of the figure so arrived at was the landlord's share. For neither of these assumptions did he find there were any precedents or authorities; and the second one he described very justly as a mere rule-of-thumb or empirical guess. He, therefore, disregarded this evidence, and constructed a valuation for himself out of the materials afforded by the evidence of the experts who appeared for the Company and St. Thomas. The latter, however, in the result, fared rather worse than Exeter. The three witnesses who were called to support their assessment of £3800 odd only valued the entire undertaking at £5404, £5635, and £4982 respectively, and of this the lion's share was claimed for St. Thomas. On the side of the Company, a total valuation was submitted of £4463. It has now been decided that the total rateable value of the undertaking is £6171; the apportionment for Exeter being £2397, for St. Thomas £3512, and for Heavitree £262. The total assessment has thus been raised from what it formerly stood at by £710; the Company being consoled by having their costs paid by the parishes. In making this order for costs, the learned Recorder observed that he had been influenced by the consciousness that his decision was rather against the Gas Company than in their favour; and he added, "I am sure "I have allowed the full value of their concern." In this opinion, it is tolerably safe to say, he will not stand alone.

It should be added—as being of importance in this case—that the structural value of the works in the parish of St. Thomas was variously estimated by the witnesses for the Company and St. Thomas at between £80,000 and £90,000. No evidence on this point was offered on behalf of Exeter. The learned Recorder allowed for them a rateable value of £3200, which is 4 per cent. upon a valuation of £80,000; 4½ and 5 per cent. upon higher amounts having been claimed by the witnesses for St. Thomas.

The Valuation of Gas Undertakings.

LAST week we called attention to the great difference between the award in the Rickmansworth arbitration and the two previous awards relating to Chard and Nantwich. Our interest in the matter is, we need hardly say, that of cheap gas, which cannot be promoted if excessive amounts have to be paid by Local Authorities for these undertakings. Comment was at the same time made on the somewhat unusual circumstance of the Rickmansworth award being an agreed one between the Umpire and the two Arbitrators. Two similar cases of agreement occur to us at the moment—namely, those of Dunfermline and Falkirk—both relating to non-statutory undertakings. In the former, the two Arbitrators agreed upon an award of £80,000, which, with the mortgage debt of £11,000, made a total of £91,000 for an annual sale of 58,521,000 cubic feet, which is at the rate of £1555 per million cubic feet sold. In the Falkirk case, the two Arbitrators (the Umpire, having been objected to by one of the parties, did not attend the hearing) awarded £77,050, including £1050 for some house property owned by the Company. Deducting this, the purchasers paid for the gas undertaking at the rate of £1443 per million cubic feet of gas sold; the annual sale at the time amounting to 52,639,000 cubic feet. There will be found, in a comparison of these figures with the amounts to be paid by Chard and Nantwich—namely, £2040 and £2166 per million cubic feet respectively—ample justification for apprehension as to the future of the gas supply in these townships; nor can it be a matter for surprise that complaints have been made of the heavy burdens imposed by the awards. There is too much reason to fear that the consumers will not have cheap gas for a long time to come. They, at any rate, will have to pay the piper, without having had the privilege or satisfaction of calling the tune. That was done for them by the respective Local Authorities; and the result should be a warning to other authorities not to allow themselves to be "rushed" into the lottery of gas purchase. For that, under the present system of valuation, it is more or less of a lottery can scarcely be denied. In the hands of a Court of Arbitrators constituted as was that of Rickmansworth, the interests of all parties are undoubtedly safe; but in the absence of any one of the qualifications which are to be noted in a perfectly competent tribunal, dissatisfaction follows almost as a matter of course.

What is the obvious intention of Parliament in sanctioning, not to say encouraging, these transfers? Surely not that consumers should be placed in a worse position by them. It is much more reasonable to assume that their object is to make matters better for them. This view is consistent with that which, according to a high authority on the subject, ought to be the governing principle of these awards. Sir George Livesey, in the course of this very Rickmansworth arbitration, quoted the opinion of Mr. Shiress Will to the effect that the principle ought to be to give to the shareholders such a price as would enable them to secure as good an income as they had been getting. He also said: "I think the first thing necessary is to give them "such a price as would enable them to find an equally good "investment without loss." Nothing could be fairer than this; for it recognizes that these are not sales of an ordinary character, justifying the very highest prices that can be secured. They are transfers of a public service from private to public hands, which in the general interest it is—whether rightly or wrongly opinion may vary—considered desirable should be made; while that they are to be carried out without injury to vested interests is an accepted principle. This means, in effect, that the local authority is to step into the shoes of the private undertakers, and reap what advantage it can from such additional economies as its position or resources may enable it to exercise. But what is to happen if the local authority get overloaded with debt in exchange for the undertaking? And how is it possible to reconcile the governing principle, as above enunciated, with such an award as that, for example, of the Nantwich arbitration, by which a paid-up capital of £6000, earning about 13 per cent., or, including the capital created out of surplus profits, £12,000, earning 10 per cent., is transformed by a stroke of the pen, so to speak, into a capital sum of over £56,000? A much smaller amount than this would have sufficed for the reinvestment of the shareholders' capital "without loss." Surely justice would have been fully satisfied by the award of a considerably less sum than the £68,000 which is to be given for the undertaking.

We have said that results such as these should serve as a warning to other local authorities not to be too precipitate in regard to gas purchase. Those who marry in haste may live to repent at leisure. Sometimes it happens that the first move of a non-statutory company in the direction of obtaining statutory powers is immediately followed by what is perhaps regarded as a clever counter-move on the part of the local authority—namely, notice of the promotion of a Purchase Bill. A community may easily find itself committed to this course without full consideration, or under the

somewhat specious idea that to delay will mean the obtaining of better terms by the company through the grant of parliamentary powers. Recent awards have shown the fallacy of this, though the desire for action on the part of a local authority may be justified by the fact that when a company promote a Bill for incorporation, it is almost a question of "now or never" with regard to purchase; it being seldom (if ever) that Parliament sanctions purchase of a statutory gas undertaking except by agreement. This, however, does not make it incumbent upon the local authority to immediately promote a Purchase Bill. They may proceed by application for the insertion in the company's Bill of a purchase clause such as has been frequently granted in such cases. This gives time to decide whether purchase be advisable, or if the provisions of the company's Bill are likely to prove more advantageous to the consumers. If purchase be decided upon, the mode of valuation should be clearly laid down; for there ought to be no more such cases as those of Chard or Nantwich—in the latter of which the consumers would certainly have been better off under the Company's Bill than they are likely to be for many years under the District Council, with its inordinate loading of gas debt.

The Calorific Value of London Gas.

THE supplementary evidence given by Professor Boys before the Board of Trade Departmental Committee on Metropolitan Gas Testing, of which a summary appeared last week, contains some interesting information in regard to the supply of gas to the Metropolis, though it is to be hoped that this does not, on all points, represent the normal condition of such supply. Professor Boys appears to have been in some doubt as to whether, in the course of his previous evidence, he had done full justice to the calorific value of the gas of the Gaslight and Coke Company. Accordingly, with that sense of fairness which should never be found wanting in anyone in so responsible a position, he proceeded to make fresh tests of the gas supplied by each of the three Companies. He commenced these tests at the Stoney Lane testing-place of the South Metropolitan Gas Company, where the gas was found to have an illuminating power of 14·65 candles, and a calorific value (the mean of four determinations) of 610·4 B.T.U. per cubic foot. It should be pointed out that the Professor speaks throughout his evidence of the gross, and not the net, calorific value. He next proceeded to the Wellclose Square station of the Commercial Company, where he found the average calorific value of the gas to be 616·2 B.T.U. It seems, however, that the illuminating power had varied during the day between 13·73 candles in the morning and 16 candles in the afternoon; falling to 15·22 candles immediately before the calorific test, and rising to 15·76 candles directly after it. This, be it observed, is the case of a Company the statutory illuminating power of whose gas is 14 candles.

Variations in the illuminating power of the gas as manufactured are inevitable; but fluctuations to the extent of 2·27 candles, within a few hours, of the gas delivered to the consumers, ought not, under ordinary circumstances, to be possible. There are few things which are more upsetting to the consumer of gas than a considerable variation in the light-giving power of his gas; and, it may be added, few things that operate more to the prejudice of a gas undertaking. Give a consumer a low quality of gas, but constant in illuminating power, and he will be abundantly satisfied; but give him a gas which varies substantially from day to day or from hour to hour, even though the low quality in the former case be not reached, and he will be disposed to, and probably will, say all that is bad of it. Such fluctuations of quality are particularly trying to the users of gas-engines, who frequently work them to the full limit of their power, and are not unnaturally annoyed at being "pulled up," it may be through failure in the quality of the gas supply.

The last test made by Professor Boys was of the gas supplied at Spring Gardens from the Beckton works of the Gaslight and Coke Company. This he found to be below the prescribed 16-candle illuminating power of that Company—namely, 15·51 candles just before the calorific examination, and 15·86 candles directly afterwards; the mean calorific value being 616·2 B.T.U. This is identically the same as was found in the case of the Commercial gas; and the illuminating power was also practically the same. Both, as Professor Boys observes, "were enriched by means of "carburetted water gas; and though the Commercial Com- "pany's consumers were only entitled to 14-candle gas, as "measured by the new method, they were really getting "16 candles, and occasionally more." Who can say, after this, that gas companies do not construe their statutory obligations in a liberal spirit?

We pass, however, to note very briefly what is, after all, the main point of the evidence, and that is the difference between the calorific values of the several gas supplies which it reveals. As has been said, it happened, when Professor Boys was making his tests, that the gas delivered by the Commercial Company was practically identical in illuminating power and calorific value with that of the Gaslight and Coke Company; both gases being enriched by means of carburetted water gas. Each gas was a candle higher in illuminating power than that supplied by the South Metropolitan Company, and yet in calorific value was only slightly better; being 616·2 B.T.U., as compared with 610·4 B.T.U. With the South Metropolitan gas, the calorific value per candle was 41·6 B.T.U., and with the gases of the other two Companies 39·3 B.T.U.—a difference in favour of the all-coal gas of 2·3 B.T.U., or between 5 and 6 per cent. How much carburetted water gas the mixtures contained, it is impossible to say; but the marked superiority of all-coal gas in calorific value is here placed on record in a manner not to be mistaken, by testimony which is at once independent and unimpeachable.

Incandescent Mantles and Carburetted Water Gas.

The question of the calorific power of gas is a live one for the gas industry to-day, in view of the report and recommendation of the Board of Trade Committee. Therefore the article which Mr. H. Leicester Greville contributed to our columns last week has an especial fitness just now; and the same may be said of the results of tests by Drs. Schmidt and Leybold, published to-day, on the effect of additions of carburetted water gas to coal gas on the light developed in an incandescent burner. In the first place, the evidence is accumulating, and makers are now freely acknowledging its truth, that the calorific power of carburetted water gas is below that of coal gas. In the case of these German tests, it is seen that, in both series of experiments, the coal gas used was superior in its thermal value to the carburetted water gas; but it would have been of assistance if the relative candle power of the two gases had been stated. The Doctors emphasize the necessity, where carburetted water gas is mixed with coal gas in variable quantities, of means being provided for regulating the air supply to incandescent burners, in order that the maximum light may be secured. Their deductions from the tests are that the rate of consumption of the gas must be raised as the proportion of water gas is increased, in order to secure the highest duty, and that, at ordinary pressures, the light obtainable from an incandescent burner can be augmented by adding carburetted water gas to the coal gas, provided the air supply to the burner is regulated accordingly. The results of the tests (as set out in tables by Drs. Schmidt and Leybold) will, there is no doubt, be received with considerable glee by the makers of carburetted water gas.

A Prosperous Gas Company and their Employees.

It was not without good reason that the Chairman of the Plymouth Gas Company spoke in terms of satisfaction last week of the satisfactory relations existing between the Company and their workpeople. Many years have elapsed since the least suggestion of trouble of any kind has been heard in connection with the Plymouth Gas-Works; and though changes of various kinds have been introduced in the methods of manufacture (some of them tending to a certain displacement of labour), the management and the operatives continued to work admirably together. This is no doubt largely attributable to the sympathetic attitude adopted by the Directors and their Engineer (Mr. Percy S. Hoyte) towards the workpeople. As Mr. Bellamy said, the question with the Board had not been one merely of pay. On this ground presumably the men have no cause for complaint. But everything cannot be obtained for money. Sympathy between employers and employed, confidence between one and the other that justice will be done, with perhaps a leaning in hard cases

on the side of mercy, are at least as potent factors as good wages in producing satisfactory results from labour. Under the present *régime*, the Plymouth Gas Company have gone far on the road to establish a claim to be regarded as model employers of labour. It is true that the profit-sharing system has not been set up, nor is there in existence a pension scheme on the lines which have been found to work so successfully elsewhere. The Company are, however, manifesting a strong desire to recognize every legitimate claim of the workmen, not only to comfort in their work and adequate remuneration for it, but to provision for old age and support for their widows. Mr. Hoyte's ambition to be at the head of a happy and contented body of workmen is thus in a fair way to be satisfied. Bearing in mind the housing conditions which prevail in certain parts of Plymouth, the hope may, perhaps, be expressed that the time will come when the Company may find it possible to do something more than they have yet achieved in the way of providing dwellings for those whom they employ. Plymouth has the distinction of being one of the most crowded towns in the country; and many of its working people live under conditions as deplorable as any to be found even in the most densely populated portions of the Metropolis. Individual employers may not be able to do much to rectify this evil; but the Gas Company, in their benevolent idea of adding to the happiness of those who contribute to their prosperity, may turn their attention in this direction with the certainty of reaping a rich reward at a very moderate cost.

The Belfast Nuisance Case.

Our "Legal Intelligence" to-day records the fact that the Belfast Corporation Gas Department have been declared guilty of causing a nuisance with their new retort-house. After a perusal of the evidence given during the several days of the hearing (which has been reported in our pages) it is impossible not to sympathize to a certain extent with both parties to the action. On the one hand, the business carried on by the plaintiffs (that of linen manufacturers) must require the surrounding air to be as free from impurity as possible; while, on the other, it was shown that the Corporation had manifested the greatest anxiety to meet the complaints of the public. The plaintiffs contended that a large bulk of their goods was rendered unsaleable and commercially valueless, owing to the quantities of smoke and grime that had been allowed to issue from the retort-house, which was situated about 70 feet from their premises. In delivering judgment, Mr. Justice Barton said that, in considering the law of the case, there were two general observations to be kept in view. The first point was that, in a busy manufacturing city, a nuisance arising from smoke or dirt must not be judged by too dainty a standard, and residents could not complain of merely ordinary inconvenience. At the same time, however, even in an industrial city the line must be drawn somewhere; and if a person was able to show that the ordinary comfort and occupation of his premises was materially interfered with, or his property injured, then he would be protected against the continuance of such nuisance. The second thing to be borne in mind was that the Corporation were authorized to make and supply gas where the alleged nuisance had been created. But their Act contained a provision that they must not create a nuisance; so that they were not outside the general law on the subject. In the first instance, the retort-house was constructed without any openings in the side, so as to avoid the complaints which it was anticipated would arise—a tube being arranged along the apex of the roof to carry the smoke off by a high chimney. This was a failure; and diamond-shaped openings were then made in the walls about 25 feet from the ground. These sent the smoke into the neighbouring houses; and so another plan had to be sought. The one adopted, however—a series of funnels on the side of the roof—proved ineffectual; and then ventilation experts were consulted, and powerful fans were installed. These, too, failed; and apparently the Corporation were then at the end of their resources, for no other plans seem to have been tried. But what they did was ample proof of their desire to avoid the creation of a nuisance; and we are glad therefore to see that the Judge has issued the injunction in a form which will not prevent Mr. Stelfox from making further experiments, if he desires to do so, in the direction of attempting to "overcome the insuperable and accomplish the impossible."

The Price of Gas in the Commercial Company's District.

In the article in last week's "JOURNAL" on "The Economy of Carburetted Water Gas," this remark was made: "The Commercial Gas Company's gas still remains—unjustifiably, it would seem—at the old familiar figure of 2s. 6d., despite the reduction of the illuminating power from 16 to 14 candles." Our attention has been invited to certain considerations in connection with this remark. The Company, it is pointed out, are on the "horns of a dilemma." They are in the position at present of not knowing what kind of gas they will be made to supply in the future. The Company went to Parliament for 14-candle gas just as the South Metropolitan Company did; and they thought they had got it. The Gas Referees, however, did not see their way, under the Act, to give the Company the illuminating power test granted to the South Metropolitan Company, or any other that the Commercial Company could suggest as suitable and correct. Then, when the Company went to Parliament to get the matter of testing rectified, the London County Council strongly opposed. Partly through this, the Board of Trade Committee followed; and their report, so far as illuminating-power testing goes, has a very uncertain note. It may be, it is suggested, that the Company will have in the future to describe their gas as of 13-candle power; and this would have a very unfortunate effect in competition with the electric light. It may be, too, that the Company will be unable to induce Parliament to give them a burner which will do them justice, in view of the obscurity of the report of the Departmental Committee. Seeing that they will have to be in Parliament next year or the year after, with the Committee's report before them it might be unsafe at present to make any material reduction in the price of gas. On the other hand this might be the best way to prove to a Parliamentary Committee that any interference with the Company's programme of progress and cheapening of gas would be mischievous, seeing that, if the conditions of supply are made more onerous, the reduction might have to be taken from the consumers. If recollection serves us rightly, the Company's price has, under exceptionally favourable conditions, been as low as 2s. 3d.; and there are reasons connected with the past—such as the high cost of capital and coal delivery through unusual circumstances—which have made what may be termed the natural price of gas in their district some 3d. or 4d. more than that charged in South London However, the Company are now working under more favourable conditions in these respects; but they have still the weight of the expensive capital of the past hanging on their shoulders. The present position in regard to price is that they are in doubt as to the best policy to adopt in view of the uncertainty before them.

The Lighting of the City.

As usual, the report for the past year of the Engineer to the Corporation of London (Mr. D. J. Ross) on the works executed by the Public Health Department contains a good deal of information on the particular branch in which "JOURNAL" readers are interested—namely, the lighting of the City. In regard to incandescent gas lighting, it is no matter for surprise to note that still further progress has been made, though even now the system has been applied to only just over half the total number of lamps paid for by the Corporation—that is, 1204 out of 2244. There was an increase of 264 in the incandescent lamps during the year; so that if the present rate of conversion is maintained, it will be some considerable time before the flat-flame burner will have been entirely banished from the heart of London. Of the 264 incandescent lamps added during the year, 189 were in the north district, 18 in the south, 17 in the east, and 40 in the west. The gain from the change to the newer system will, of course, not be merely in the matter of light, for in regard to cost also there is a substantial benefit derivable. Mr. Ross points out that with gas at the present price—namely, 2s. 5d. per 1000 cubic feet—the cost of the incandescent lamps is £3 8s. 2d. each per annum; while that for the 5 cubic feet flat-flame burner and lamp is £3 14s. 3d. for the circular, and £3 10s. for the square lantern. The number of lighting hours in each case is 4300 a year; and the prices include the cost of gas, cleaning, lighting, and maintenance. From the middle of May until Christmas, the prices charged for gas and the maintenance of the incandescent lanterns were the same as the previous year; but the fixed rate of 4s. per lamp per annum for mantles was withdrawn, and a

charge of 4d. for each mantle used was substituted by the Gas-light and Coke Company, and accepted by the Corporation. Another change occurred during the year by the Gas Company taking the work of renewing the mantles out of the hands of their sub-contractor, and placing it in those of their own staff.

Some Details.

We are also glad to see that progress has been made with the installation of high-pressure lights; the fitting up of another Keith light and a Welsbach self-intensifying lamp (the latter on trial) being chronicled in the report. The number of defective gas-lights observed during the year was 3570—145 flat flames, 3288 ordinary incandescent, and 137 high-pressure lamps—and in addition to this 279 defects in the lanterns were reported to the Gas Company. It is a relief to notice that nearly 3000 of the defects in the incandescent lamps are classed under the heading of "feeble lights;" while only 38 of them went out. It is thus safe to assume that the great majority of the imperfections of which complaint was made were by no means of a serious character. As to electricity, it is pointed out that the main thoroughfares of the City are lighted by 508 arc lamps; and the price paid for each is £26 per annum. Among these, there were 255 defects observed during the year; and in all of these cases the City of London Electric Light Company were fined. There has, it seems, been no increase in the past twelve months in the subways for gas, water, and other pipes; the length still remaining at about 1½ miles. There has, however, been a considerable addition to the mains laid therein. In the report issued by Mr. Ross a year ago, it was stated that "under the provisions of the City of London (Various Powers) Act, 1900, bye-laws regulating the charges for the use of the City subways have been prepared; and these are now waiting for the approval of the Board of Trade, to whom they had to be submitted." The same paragraph appears again on the present occasion; and one cannot help wondering how many more years will elapse before the Board find themselves in a position to tackle this gigantic question.

An Appreciation of Professor Dixon's Lecture.

The principal leading article in a recent number of the "Engineer" dealt appreciatively with the brilliant lecture on "The Mechanism of Combustion" delivered by Professor Harold B. Dixon at the June meeting of the Institution of Gas Engineers. The writer points out that in the man of science scepticism is one of the brightest virtues, and that he must even go out of his way to be suspicious. Indeed, doubt must be his faith. He must not allow apparently conclusive evidence to coerce him into a belief if he feels an atom of misgiving as to its truth. "He must examine and pry into all accepted theories, and if there is the merest trace of a flaw, he must search it and probe it; and if he be satisfied that it is more than skin deep, he must not rest till, with wedge and lever, he through this little crack has rent the whole fabric asunder." Professor Dixon's lecture is characterized by the writer as a splendid record of the value of scientific heterodoxy. Its substance was a searching inquiry into the accepted theories of the inflammation of gaseous mixtures; and its conclusion was that several of these theories, particularly the teaching of Bunsen that explosion occurs in successive steps, are erroneous. This conclusion is the outcome of a number of years of industrious labour and many profound investigations, some of which, the writer points out, are really of the greatest importance to the maker of internal-combustion motors. Much of the lecture turned more or less upon the rapidity with which flame spreads through an explosive mixture; and this is the matter to which our contemporary directs the attention of the class of mechanicians above referred to, more especially those who produce motors rotating at very high speeds. Dr. Slaby, who conducted an investigation into the working of internal combustion motors, had no experience of the high speeds of rotation which are now common. He speaks of the necessity for combustion being complete in 0·03 to 0·06 of a second; whereas the writer in our contemporary shows that even at moderate speeds of motor-car engines not more than 0·025 of a second is given to the whole out-stroke. Bearing this in mind, the question is asked whether still higher speeds may not in time be found practicable. If so, the conclusion is arrived at that Professor Dixon's investigation may help in securing the enormous velocity of combustion that will be necessary if high efficiency is sought.

WATER AFFAIRS.

Sanitarians in Conference in Glasgow.

THE holding of the annual congress of the Sanitary Institute in Glasgow last week afforded the usual opportunity for the discussion of many subjects bearing more or less directly upon the public health, but of only a few with which our readers are specially concerned. The Institute has, however, done so much good work since it came into existence the year after the passing of the Public Health Act, 1875, that the proceedings at its annual gatherings ought not to be passed over without notice, if only from the fact that a good supply of water is an important element in bringing about the improved sanitary conditions which it is the object of the Institute to secure. When the founders entered upon their work, sanitary science was very little known. But, at all events, this point was recognized—that every poor person inherits a natural right to be furnished, at a cost within his means, with good air and water and a healthy dwelling; and it was hoped it would be possible to enforce such hygienic laws as would improve the physical and moral condition of the people, promote their happiness, and prolong their lives. The outcome of the work of the Institute has been the collection of a large amount of valuable information, acquired by patient scientific observation; and its effect is shown very strikingly in the present lower death-rate. The city selected for the congress this year exemplified this, and attention was directed to the point by Lord Blythswood, in the address with which he opened the proceedings. It is just twenty-one years since the Institute met in the city on the Clyde; and in the interval many improvements have been effected in its sanitary arrangements. Conspicuous among them is, of course, the introduction of an abundant supply of water from Loch Katrine; and accompanying it is the drainage scheme by which the river is gradually being changed from the condition of an open sewer, and being brought back to something approaching its original purity. Already a marked improvement has been shown by the decrease in the death-rate from 23 per 1000 in 1893 to 18·4 per 1000 last year; while in the week preceding the congress it was only 15. From this fact, as the Lord Provost remarked, sanitarians may take courage and hope.

The subjects connected with water supply which came before the congress were discussed mainly in the section devoted to engineering and architecture, over which Professor Henry Robinson presided. His address dealt chiefly with the disposal of sewage; and he threw out a suggestion that the Royal Commission might define the lines which legislation should follow on the question of the advisability of dividing the country into drainage areas forming natural boundaries coterminous with sanitary districts, so that the needs of the entire population within each area should be equitably dealt with. There is nothing particularly novel in this idea; and all Professor Robinson could do was to give emphasis to what is gradually being recognized as necessary for achieving the best possible results in connection with sanitation. A question which touches our readers more closely was introduced by Dr. J. R. Kaye, who read a paper on the "Supervisory Control of Water Supplies," and urged that the subject demanded investigation by a Royal Commission specially appointed for the purpose. Here, again, very little could be added to what has already been stated by the British Association of Water-Works Engineers and the bodies allied with them in the movement they are making in the direction indicated by Dr. Kaye. A thoroughly practical subject was brought under notice by Mr. Gilbert Thomson, of Glasgow, who discoursed upon "Domestic Sanitary Engineering." He pointed out that the present standards of design, construction, and testing are simply those of the various building regulations; and he complained that these simply encourage the production of work that will pass muster, rather than raise it to the high standard which is sometimes to be met with. Mr. Thomson believes the better-class work would prove the more economical in the end. So do we; but the difficulty is to bring others to the belief. It would be a poor congress of sanitarians who could not have something to say about the plumber and his work; and Dr. R. Crawford, in his address on "The Municipality and the Plumber," called for support to the Bill by which an endeavour is being made to secure

legislative recognition of this tradesman, and guarantee his competency by registration. High-class fittings, and thoroughly competent workmen to put them in—here are two objects worthy of achievement. Without indulging the hope that the various suggestions thrown out at the congress will be adopted, if those to which we have briefly referred are moved one step nearer realization by the additional light thrown upon them in the discussions, we shall have made further progress towards the goal which the founders of the Sanitary Institute had in view at the time of its inauguration.

Ilfracombe's New Water Supply.

Ilfracombe is to be congratulated on the courage and success with which it has tackled the subject of water supply. An abundant service of pure water is the first and greatest of all needs in a health resort. This fact has been recognized in Ilfracombe in the past; and it is no doubt owing to the excellent sanitary provision by the local governing body, no less than to its beautiful natural surroundings, that the town has made such headway in popular favour. It has now for the fourth time outgrown the means taken for supplying it with water, and has wisely made what promises to be abundant provision for a long time to come. About the purity and excellence of the new supply, drawn as it is from the lonely heights of Exmoor, there would seem to be no reason for doubt. Dr. Collingridge, the Medical Officer for the City of London, who had visited the works, spoke in the highest terms of the quality of the water; while as to quantity, Exmoor may be trusted to give an unfailing yield so long as the English climate remains what it is. All of our health-resorts are not so well situated as Ilfracombe in having an abundant supply of water within a reasonable distance; but none can spend more wisely than in making the very best provision for a water supply possible in their circumstances. No investment is likely to yield a larger return. The ceremony associated with the inauguration of the new supply last Wednesday was unfortunately marred by rain; but the presence of the Lord-Lieutenant of the County (Viscount Ebrington) and that other distinguished Devonian, General Sir Redvers Buller, as well as of Dr. Collingridge, lent an interest to the proceedings which no amount of rain could damp.

The Valuation of Gas Undertakings.—In the "Journal" last week, there was an editorial bearing this heading; and the major part of it was founded on the Rickmansworth award and arbitration proceedings. In a reference to the valuation of Mr. Corbet Woodall for the Company, it was stated that "interest on the mortgage debt was not deducted by Mr. Woodall from the revenue account; so that, according to his valuation, the debt would have been paid twice over by the purchasers." What it was intended to convey was that, the debt having been deducted, the interest on the debt ought also to have been deducted from the revenue account. It is clear from our report of the arbitration proceedings (in the "Journal" for April 26 last) that the amount of interest was not deducted by Mr. Woodall. Referring to page 250, it is seen that his total valuation worked out to £41,147; and, after deducting the mortgage debt of £3933, his total valuation was £37,214. In his address, Mr. Talbot, for the Council, was criticizing this (or rather the round sum of £38,000), when the Umpire remarked (p. 251): "You know £5000 or £6000 comes off it with regard to deducting the interest." Again, before the conclusion of the proceedings, Mr. Wedderburn, K.C., for the Company, amended the valuation, and asked for £33,440. This is the explanation of, and the grounds for, the remarks made in last week's issue.

Electricity Direct From Coal.—Herr R. Lorenz has lately given in a German technical publication a capital summary of the present state of the problem of directly converting the chemical energy of burning carbon into electricity. The slow combustion involved in an electrolytic process such as is exemplified in an ordinary voltaic cell suffers under three disadvantages—viz., the slowness of the reaction between carbon and oxygen at ordinary temperatures; the impurity of the carbon, which gives rise to complicated hydrocarbons in solution; and the necessity of using the high-priced conducting forms of carbon instead of ordinary coal. These circumstances led to the adoption of a gaseous "electrode" consisting of carbon monoxide, as in the cells of Bucherer and Borchers. In these, however, the currents obtained cannot be proved to result from the further oxidation of the carbon monoxide. Another and more indirect way of utilizing the energy of carbon is that suggested by Nernst, in which it is used for regenerating other cells, such as Daniell's, by the reduction of the zinc sulphate. M. Lorenz says the problem is theoretically soluble, but will require much detailed work for its final solution.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 351.)

The Stock Exchange last week was, as a matter of course, strongly dominated by the apprehension which agitated all sorts and conditions of men. The question (or rather questions, for there seem to be three distinct problems of International Law raised) arising out of the actions of Russian vessels—more or less ships of war—caused a dangerous ferment in public feeling; and that sensitive barometer, the Stock Exchange, quickly felt it. Happily people kept their heads fairly cool; and, aided by reassuring Ministerial utterances, the temper of the country may be quoted firm and calm. Prices, of course, had a relapse; but they became firmer before the close, which was in itself a good sign, since the ordinary tendency when closing for the holiday season would be towards greater ease. In the Money Market, there was a very strong demand for the Stock Exchange settlement of a rather heavy account, and for other purposes, which combined to stiffen rates considerably. And discount also was very firm. Business in the Gas Market was much more lively than in the preceding week; but it was to a great extent confined to the issues of the two leading Metropolitan Companies. The tendency all round was remarkably steady; and there was not a single variation made in the quoted prices. In Gaslight and Coke issues, the ordinary was very active on most days, and changed hands at level figures ranging from 94½ to 95⅞. Not unnaturally, the best prices were made at the beginning of the week, before the general flatness was at its worst. But had it not been for this influence, the accounts just issued by the Company might have been expected to advance the price. South Metropolitan was done daily at even prices, ranging from 125½ to 126½. Here also a rise might have been looked for under ordinary circumstances. Commercial was little dealt in. This Company's accounts are not yet due for issue; but there is good reason to anticipate that they will show an increase of business fully equal to that of the other two Metropolitan undertakings. In the Suburban and Provincial group, there was little doing, except in Brentford—a Company who have had a most gratifying half year. Hardly anything was done in the Continental Companies. Imperial was steady; but Union was inclined to be weaker. The remote undertakings offered nothing for remark.

There was very little business doing in Water Stocks; but there was sufficient movement to produce a change in two or three quotations. These were in the downward direction, and were, of course, the result of the feeling which depressed gilt-edged securities in general.

ELECTRIC LIGHTING MEMORANDA.

The Lords and Electrolysis—An Ancient Principle and the Supremacy of the Board of Trade—The Bermondsey-Northumberland Clause.

The fighting at Westminster over the question of protection against electrolysis and compensation for proved damage has reached an acute stage; and it is now quite easy to see precisely the position. The cases of Edinburgh, Stretford, and Torquay have only to be studied to come to a very definite conclusion. Select Committees of both Houses are found who see the justice of the claims of pipe-owners; the Unopposed Bill Committee of the House of Commons are not averse to allowing agreed clauses for protection to proceed; but when we come to the Chairman of Committees of the Lords, there we have the barrier, and (nothing disrespectful to the person of Lord Balfour of Burleigh is intended) it is a substantial one, strongly stanchioned by the Board of Trade. Nothing more than the remarks of Lord Balfour in defence of his action in this matter, in the Lords discussion over the Torquay Tramways Bill yesterday week, is required to prove this. He is governed in the matter by two things—First, by the assurance of a representative of the Board of Trade that, up to the present time, no case of injury to pipes or mains through electrolytic action has been made out; and, secondly, because it has been the principle of the House since Lord Cross's Committee sat in 1893 to follow only one course in this matter. In other words, it has been the principle of the Lords to disregard everything but things as they existed, or were believed to exist, eleven years ago, and not to admit that that long period could have brought a change in the condition of affairs.

Now it is not a very assuring thing to see the Chairman of Committees of the Lords ruled by a representative of the Board of Trade and by an ancient principle, though it may be a traditional characteristic of the Upper Chamber to conserve the hoary and crusted and to ignore the new, no matter what its merits; nor is it an enlivening spectacle to see the House of Lords dominated in any single matter by a Government Department. That, however, is what their present attitude on this electrolysis question amounts to. With all deference to Lord Balfour, we should like to assure him that he makes a serious mistake in going to the Board of Trade for evidence of what has happened already in the way of electrolytic action; and when he tells their Lordships that it is within the power of the Board to make new

regulations and take action directly a suspicion that damage is being done is brought to their notice, he speaks from out of the simplicity of his confident heart, for there has been something more than a "suspicion of damage" brought before the Board of Trade during the past few years. If the present regulations are sufficient, what harm would be done to the electrical people by the insertion of the compensation clause? Neither Lord Balfour nor anyone else has yet answered this inquiry. If his Lordship wishes to see the other side of the question—though he does not appear to be particularly desirous—why does he not move for the appointment of a Committee of Inquiry into this matter of electrolysis, for there is the cumulated knowledge and evidence of the eleven years since Lord Cross's Committee reported, and upon which report the Board of Trade Regulations were framed. If such a Committee of Inquiry were appointed, there would be brought from all parts of the country ample proof that pipes are now suffering in a manner that they were not doing before 1893. It should be remembered by the Lords that electricity distribution—especially in regard to traction—was not in that year what it is now.

But with reference to this Torquay business, it will be somewhat difficult for Lord Balfour to reconcile his speech and action in connection with it with his consent to the re-establishment of the electrolysis clause in the Lothians Electric Supply Bill, which is a matter upon which remark was made in the "Memoranda" last week. Yet there is a remarkable similarity in the two cases; and, if anything, there is more reason why the clause should stand in the Torquay Tramways Bill than in the Lothians Bill, seeing that at Torquay it is the Dolter surface-contact system that is to be used, and that is an untried system in this country. One of the terms upon which the Torquay Corporation gave their consent to the scheme was that there should be inserted an electrolysis clause for their water-mains and the gas-pipes in the St. Mary district. Argued the Torquay Gas Company, what is good for the Corporation in this respect is good for us; and so considered the Commons Committee before whom the Dolter Bill came. When the measure got to the Lords, out came the clause; and the Corporation and Gas Company then showed, before the Select Committee of the House who considered the Bill, common cause why it should be reinstated. They again succeeded. The Bill once more came under the notice of Lord Balfour; and, with the words of the Board of Trade representative in his ear and the ancient principle dangling before his eyes, he again made short work of the clause, by putting his pen through it. The House of Lords were then asked to re-establish it on the grounds that it was part of the bargain made with the Corporation when they gave their choice to the Dolter tramway system, and that the system was as yet one with which there had been little experience. A report appears elsewhere from which it will be seen that Lord Balfour, the Board of Trade, and the eleven years' old principle governed the vote. That is the position of the electrolysis question to-day. Yet our advice is that the struggle must not be given up. Without agitation, the present and final barrier will only become more firmly fixed; and it is only by importunity that the owners of subterranean pipes will get the Lords to look beyond the Board of Trade and Lord Balfour to see what this electrolytic question really is. Then perhaps they will find that there is another principle of their House that has been overlooked by them in this connection, and that is the sacredness of property.

Congratulations to the Lea Bridge Gas Company over the far greater success they have scored in the Lords in their opposition to the Leyton District Council Electricity and Tramways Bill than when the Bill was before the House of Commons. This success on a second contest shows the usefulness, in some cases, of the double inquiry afforded by the Private Bill procedure, as compared with that which obtains in the case of Provisional Orders. The Company's opposition was conducted by Mr. A. M. Paddon. The Chairman of the Committee was Lord Newton; and, inasmuch as his Lordship had the previous afternoon spoken rather strongly against the Torquay electrolysis clause, the petitioners omitted electrolysis as the fourth point in their application. The other three were that the Duke of Northumberland's modification of the Bermondsey clause should be inserted; that the provisions of the Tramways Act of 1870 should apply to all the lines in the district which would be reconstructed, and not merely to new lines; and that the Swindon clause with regard to free wiring should be applied. In regard to the second point, it was asked that the protection given in the Hove and Worthing Tramways Act of last year should be inserted—viz., "For the purpose of section 70 of the Tramways Act of 1870, the adaptation of the existing tramways for working by electric traction shall be deemed to be the laying down of tramways." Respecting free wiring, the Swindon clause was the one asked for. It may be remembered that this reads: "Provided also that nothing in this section shall authorize the Corporation by their own servants or workmen to fix upon any consumer's premises electrical fittings or electrical wiring other than may be required for the service line between the Corporation supply mains and the meter on such consumer's premises." The parties agreed on the question of free wiring; and the Committee granted the other two requests of the Gas Company, though very strongly opposed by the promoters. It has transpired that one effect of the imposition of the Bermondsey-Northumberland clause has been that the District Council have since withdrawn the free-fittings clause. So much the better for the district. It is a healthy sign to find one of our electrical contemporaries (in a comment upon this success of the Lea Bridge Gas Company) advising that "promoters of electrical undertakings might almost concede the Northumberland clause to the gas companies without any misgivings, in order to save the expense of an opposition."

THE ELECTRICITY SUPPLY BILL.

In the references which have lately been made to the Electricity Supply Bill in the "Electric Lighting Memoranda" and in a special article published on the 26th ult. under the title of "A Serious Menace to Gas Companies' Interests," we have endeavoured to show, in perspicuous language, the importance of this Bill to gas interests—not only in respect of the plenary powers which it commits to the Board of Trade in extending the opportunities of municipalities for engaging in the electrical business without let or hindrance on the part of the ratepayers, but also in respect of the further evidence it affords of the tendency of the Board to immolate all other interests in favour of those that are electrical. It is all very well to nurse and pamper the younger public services; but it causes a large amount of rancour when this is done to the detriment of the older ones. To the latter, the attitude of the Board of Trade is too apparent to be pleasant; and the gas industry must not sit tamely by while their interests are being affected by any grandmotherly weakness. But these are matters which, in view of recent comment, we need not labour on the present occasion; the purpose of our article to-day being more particularly to describe, as tersely as possible, the designs of the Bill in its amended form as reported to the House of Lords.

In the first place, there is the much-debated clause referring to the compulsory acquisition of land. It gives the Board power to authorize, by Provisional Order, any local authority, company, or person, to acquire compulsorily for a generating-station any land specified in the Order, whether situated within or outside the area of supply, and, in the case of a local authority, whether situated within or outside their district. Of course, there are several provisoes attaching to the clause, around which there was considerable discussion when the Bill was before Lord Wolverton's Committee. The clause may prove to be very objectionable from several points of view, not the least being that it may be used to favour the electrical industry to the disadvantage of other industries. This was seen by the Gas Companies' Protection Association; and they secured the insertion of the protective clause (true it has been placed almost at the end of the Bill, and not in juxtaposition to the clause affected) which disallows the compulsory acquisition of land that, at the date of the first publication of the notice for an Order, belongs to any gas undertakers, and is used, or is authorized to be used, by them for the purposes of their undertaking.

In view of this compulsory acquisition of sites outside a district of supply, it is necessary to give the Board of Trade authority to apply the provisions of the Electric Lighting Acts to the breaking up of streets, &c., outside a supply area. This is being done by the second clause of the Bill. The supply-in-bulk clauses which follow did not meet with consensual favour; and they were discussed freely before the Committee, and with some acerbity. By them—unless the Board are of opinion that, by reason of the character or magnitude of the proposed undertaking, the matter ought to be dealt with by a Bill—they may authorize any company or person to supply electricity in bulk to any local authority, company, or person authorized to supply electricity in any area for the purpose of distribution within that area. Further than this, the Board may provide for the supply being made compulsory. To the local authorities, it appeared to be a most heinous thing that companies should be granted this, and that they should not be. We have dealt with this matter before; and it may be remembered that the Board of Trade went the length (with the permission of the Committee) of adding to the clause so as to allow any local authority to supply electricity in bulk to any other local authority. This is not by any means regarded as sufficient amends by the local authorities, although, in our opinion—looking at the matter from the points of view of the ratepayers and of the objectors to rampant municipal trading—it is giving them much more head than is necessary or reasonable. One rather wonders what will happen, in the event of the Bill becoming an Act, when a local authority takes over an undertaking the proprietors of which have been exercising the powers of supply in bulk which the Board will be able to confer upon electricity companies.

Perhaps this is intended to be covered by the succeeding clause. In this the Board may, by a Provisional Order authorizing a company or person to supply electricity in bulk only, exclude the application of the power of purchase given by section 2 of the Electric Lighting Act, 1888, in respect of the whole or any part of the undertaking authorized by the Order; but, before doing so, they must cause notice to be given to any local authorities who have the right to purchase under the section, and must consider any objection made by any of those authorities. There are subsidiary provisions which have been the subjects of tremendous discussion. For instance, for the purposes of purchase, a generating station situated outside the area of a would-be purchasing

local authority is to be deemed to be within their area; and where a generating station is used for supplying electricity within the districts of two or more local authorities, the Board are to be allowed to make such adaptations in the provision as the circumstances of the case may require. There were some four or five companies who felt themselves aggrieved by this clause—seeing in it special facilities for purchase which they did not regard as altogether desirable. In the result, to meet their opposition, a proviso was attached to the sub-section to the effect that it should not, "without the consent of the company to which they belong, apply to any generating station, main, or other works authorized by Special Act before the passing of this Act." A further sub-section gives to an authority having the right to purchase part of an electricity undertaking, permission to transfer—with the consent of the Board of Trade, and upon terms and conditions approved by them, and with the consent of the company—their rights of purchase to any other authority also having power to purchase a portion of the undertaking.

Another clause which will greatly assist in expediting municipal trading is one which will permit (if thought expedient by the Board of Trade in concurrence with the Local Government Board) of the exercise of electric lighting powers by two or more authorities jointly in any area of supply consisting of the whole or parts of the districts of those authorities. When the Bill was before Committee, it was very properly sought, on behalf of electric lighting companies, to make it clear that this should not affect an area in which any company were supplying, or were authorized to supply, electricity, otherwise than with the consent of the Company. The municipalities strenuously opposed this addendum; and the clause stands as originally drafted. But the municipalities were not so favourably disposed to the clause which gives the Board of Trade a greater latitude in respect of the dispensing with consents of local authorities in considering whether a Provisional Order should or should not be granted. The Board have so far got all they asked for in this regard.

The other clauses are not of a character that affects the consideration of the Bill in the lights from which it has recently been examined in these columns. There is one which reduces the period for the revision of maximum price from seven to five years; there are others referring to the certification of meters; another dealing with the dates at which the accounts of local authorities are to be made up; while a further one provides for a minimum annual charge for a supply of electricity in cases where premises have also a separate service.

From the foregoing digest of the provisions of the Bill as it has been amended, it will be recognized that this supplementing of the powers of the Board of Trade, and the removing to a larger extent of municipal electrical projects from the surveillance directly of the ratepayers and of Parliament, constitute, as we have already put it, a serious menace to the interests of gas companies, both as ratepayers and as suppliers of a commodity competing with one under municipal protection and backed by the local rates.

THE POSSIBILITIES OF THE QUESTION-BOX.

An American Gas Encyclopædia—Why not for All English-Speaking Gas Men?

THERE has been a certain amount of ridicule hurled against the innovation in American Gas Association work known generally as the "Question-Box." Those who scoff perhaps hardly appreciate what it is, what are its possibilities for good, and to what it may yet develop. The best form of the question-box that we have yet come across is undoubtedly that as practised by the Ohio Gaslight Association. Albeit the most expensive in its working, it has about it the elements of being most profitable, durable, and accurate. We tried to show just recently, in a series of articles having for their foundation the last Question-Box volume, something of the constitution and results of this branch of the work of the Association. The work, however, is now undergoing further development; and this development opens up a new vista which we can see has its end in an encyclopædia on the science and practice of the manufacture, distribution, and utilization of coal gas, without in kind, up to the present time, an equal. That is the prospect; and, if the goal in view is as stated here, it has our benediction and support, notwithstanding that the end will be essentially American. But on this point more presently.

There is a matter of some importance, or rather a suggestion, involved in the present development; and we want to work up to it *ab initio*. It may be there are among our readers many who have not closely followed the work of the Ohio Gaslight Association in connection with the question-box; and therefore to give them a clear understanding of what is now in hand, we may make this explanation. It is now some two years since that a circular-letter was sent by the Association to everyone in the United States known to be interested in gas. The letter covered an invitation to all gas men to suggest questions on subjects relating to the gas industry on which they wanted information, or which they thought it would be profitable to bring before the Association. This was the beginning of the Question-Box as practised by this particular organization. A large and diverse list of questions was obtained, representing many different points of view—changing in subject with the official position and interests of the author, and varying according to geographical situation and general environment. At this point, the Question-Box of the Association departs from the ordinary lines. The questions are not brought before meetings and answered, as our American friends would put it, "from the floor;" but the questions are collected and classified, the completed lists are sent out, and each correspondent is requested to answer as many questions as he feels capable of doing. Even as the result of the first circularizing, the answers received were many and various, representing a veritable mine of valuable matter. Where topics were subject to differences of opinion, the range of views opened up a fertile field of suggestion. All this mass of question and answer was then sorted, classified, and edited by Mr. H. L. Doherty, and in printed volume form presented at the annual meeting. There have been two volumes issued; and it is the purpose of the Association to continue the work—gathering each year, if possible, an increasingly larger harvest of material, and so adding to the store previously secured. The last volume contained 341 pages; and now that it has been determined to continue the work, the fund of information which will eventually be collected in classified form is simply incalculable.

This brings us to a matter which if it continues will mar, if it can be extirpated will put beyond price, the huge collection of technical matter thus impounded as a source of reference and guidance, both in the present and future. That is the element of uncertainty. No single man, carrying out the functions of editor could possibly revise and check all the material delivered to him through this institution. But if that unreliability can be replaced by a reliability which will give confidence to those who turn to the record for positive information and advice, then it is believed that the Association will produce in a very short time an encyclopedic work that will surpass any single venture ever before attempted for the advancement of the gas industry. This is the belief; the realization must be judged on its merits in the future. But in addition to revision, there is another consideration. Flood upon flood will form a deluge; and there is the danger that, in time, the value of the work would be impaired and hidden by its forbidding bulk. Therefore, after each year's harvest of contributions has been published, what is then required is that the whole shall be sorted out, digested, and merged into a compendium which will represent everything worth keeping that has been received up to that point, and that the material shall be supplemented, wherever possible, with data and further references. Well, now, these are points that have been recognized by the Ohio Association; and, at the last meeting, very hearty approval was given to the proposal that a Board of Revision should be constituted, representing, as nearly as possible, the best technical material within the compass of membership. This Committee have been appointed; and they have issued a preliminary notice calling attention to the fact that the work in which they are going to engage during the current year is the digesting, editing, and annotating of the contents of the two volumes of the Question-Box already issued. As a preliminary, all contributors to either issue are invited to forward to the Chairman of the Committee, Dr. H. B. Harrop, of No. 131, Twenty-fifth Street, Milwaukee, as quickly as convenience will allow, any comments, changes, or additional notes, bearing on their original contributions. Beyond this, suggestions and data are invited from everyone concerned in gas, whether he has previously interested himself in the Question-Box or not. A number of Sub-Committees are to be organized; and the material will be classified into groups and assigned to the appropriate Committees for review—to the end that all matter resting upon unquestioned scientific fact or unimpeachable experimental data will be stamped with the seal of authority; and, on the other hand, where difference of opinion is widespread, the differences will be brought into prominence. If they cannot be immediately reconciled, then the necessity for further inquiry will be suggested until certainty—if it be at all possible—is realized.

This is the development; and it can be readily seen what large possibilities of reward there are in it—for the expenditure of energy and money by Dr. Harrop, his colleagues, and the members of the Association generally—by the production in the result of a gas encyclopœdia and compendium of gas knowledge of unrivalled extent and value. With the systematic revision that is going to be given to the work, there can be no doubt on the score of value; and this brings us to the suggestion which at once flashed to mind on learning of this new development of the Ohio Question-Box. Why should there not be co-operation in this matter throughout the ranks of English-tongued gas men, no matter to what country they belong? We have handbooks and text-books in sufficient number, but we have not what can be seen at the end of the avenue of work into which the Ohio Association have deliberately entered. They have before them a formidable task; and it would be an equally formidable task for the Institution or any other British Gas Association to commence, to carry on, and bring to completion any similar work. Completion, though, there cannot be; there can be no finality to the knowledge involved in such a progressive industry as that of gas. But an encyclopœdia or compendium of knowledge could be developed to a certain date; and later continued to the close of another period. To do work of this kind for the gas industry in one English-speaking country will be to only half do it; and for the representatives of the industry in another country to take up similar work at a later period would be merely a doubling of the labour. Then why not co-operate—link brains, hands, and

interest—and make one good job of the work? This is only a thought; and we have done with it so far. It is for others to inquire into and develop it. Whatever the result, there will be no two opinions that such a work—voluminous it would necessarily be—would greatly enrich the literature of the gas industry. This is a suggested development upon the development of the Ohio Gas Association. If anything is done, we repeat, it must be on the initiation of others.

SMOKE AND FUEL WASTE.

[Communicated.]

How slow is the progress we make towards a higher standard of health and comfort, is illustrated in nothing more clearly than in the constantly recurring discussion of remedies for the smoke nuisance. Year after year of effort stretching back into dim centuries—of Acts of Parliament, scientific inventions, and smoke abatement exhibitions—have brought us very little nearer the goal of a clear and healthy town atmosphere. In spite of all that has been done, and the much more that has been said and written, the smoke pall still hangs over our manufacturing districts—visible and palpable evidence at once of a reckless waste of our natural resources and of the incompetence of man to rid himself of the inconveniences attendant upon modern civilization. At the same time, it would be wrong to conclude that nothing has resulted from all the attention directed to the subject. The Black Country would be blacker, and the smoke cloud over large cities more dense, had not science done something towards solving the problem of the economical use of fuel. The extent to which the gas-stove has replaced the open fire, and the gas-engine or electric motor the steam-engine, is the measure of the progress we have made towards a remedy for one side of the evil. Much remains to be done; but the situation is not altogether hopeless.

The problem presents itself mainly in two phases: (1) How shall we rid ourselves of the nuisance arising from thousands of domestic chimneys, each contributing its little to the volume of dirt and poisonous gases? and (2) In what manner can power be economically distributed so as to displace the steam-engine and get rid of the tall chimney and its smoke? With regard to the domestic hearth, custom has a great deal to do with the perpetuation of a system which is both costly and dirty. The open fireplace has so established itself among our institutions that all who study the question of domestic heating have to consider it largely as one of appearance, as well as of warmth. We want, not only to be warm, but to see the fire. In this respect, gas has some advantage over other methods of obtaining heat without smoke. A modern gas-fire is in appearance a tolerable substitute for a coal-fire; and in cleanliness, readiness for use, and most other things, it is vastly its superior. Where coal is dear and gas is cheap, as sometimes happens, the gas-fire is no doubt also the more economical method of heating. The enormous extension which there has been of late in the use of gas for cooking—particularly in connection with slot meters—has done a great deal to lessen the volume of smoke from house chimneys, and at the same time has contributed no little to the domestic happiness of many overworked women. In all large towns, there are hundreds of houses in which it is found unnecessary to light a fire from week's end to week's end, where formerly the kitchen stove, at least, had to be lit up early in the morning for breakfast and kept going during the greater part of the day.

It cannot be pretended, however, that the gas-fire and the gas-stove are perfect, any more than is the open fire which they are partly replacing. If the cooker is in cleanliness, handiness, and economy superior to the kitchen range, there is the drawback that it does not furnish a constant supply of hot water; while a good deal of heat from the oven, which might go a long way towards providing such a supply, is wasted. A fortune still awaits the man who finds a perfect solution of the water-heating problem in connection with the gas-cooker. The geyser is admirable in its way; but the reports of accidents arising from its ignorant use have sufficed to banish it from many houses where its ready supply of hot water would otherwise be much appreciated. Dresden seems to have found a means of solving this and some other problems associated with the question of domestic heating, by supplying superheated steam from a central station. The supply is distributed under pressure, through carefully insulated pipes, to buildings within a radius of 1320 yards. The convenience of such a supply of heat can hardly be overestimated. In combination with gas for cooking, and even with a gas-fire for those who must have "something to look at," such a system of distributing heat should satisfy all ordinary needs. It is said that the Dresden installation yields a handsome profit. No doubt, the system would pay in this country also if a sufficient number of users could be found in the immediate locality of the steam-raising station. If the question of the number of consumers per mile of main or cable is of importance in the distribution of gas or electricity, it is of still greater moment in the distribution of steam. This fact, combined with the difficulty of obtaining sites for generating stations in districts which would probably yield the most remunerative business, is likely to operate against any general adoption of the Dresden plan in England. It is, however, worthy of note as a method of grappling with the smoke nuisance which may yield greater results than now seem to be in any way possible.

With regard to the manufacturing side of the problem, with its forests of chimney stacks, the wonder is that—in spite of all the inducements which are held out to economy in works cost—owners of factories are content to see so much potential heat pouring in black clouds into the atmosphere, instead of finding its proper sphere in the engine cylinders. When we consider the difference between the product of a ton of coal employed in a gas-works and a similar quantity consumed in a boiler furnace, it is difficult to understand why men who are in most things so keen, go on living under the cloud of smoke which their money is helping to make. It is true that in manufacturing districts people come to look upon dirt as a sign of prosperity. Smoking chimneys are associated in the popular mind with works fully employed; and people inhale sulphuric acid and all the other noxious products of coal smoke with a sort of feeling that in this way only are life and wealth possible of attainment. The very opposite ought to be the fact. The smoking chimney is clear evidence of waste; and the time no doubt will come when popular lecturers will make their audiences shudder as they draw vivid pictures of the reckless manner in which the men of this age dissipated the resources of Nature, and defaced the earth with dirt, because they did not know how to burn coal in a scientific manner. So far none of the substitutes offered for the steam-engine has made much impression upon the enormous volume of smoke daily produced in the manufacturing districts. There are innumerable gas-engines in use; power-gas plants have been laid down in some places; water gas, too, has had its advocates as an aid to industry; while the number of electric motors has increased considerably with the development of electricity works all over the country. Still, the smoke problem remains to be solved. It is in the main a question for large works; and in connection with these it can after all be only solved by showing that better results can be obtained without smoke than with it. As to domestic fires, it has been suggested that a stimulus might be given to methods for the abatement of the smoke nuisance by imposing a tax on houses which have smoke-emitting chimneys. This would certainly tend to benefit the gas-stove industry; and if the tax were sufficiently high, it would add something to the National Exchequer. But the Chancellor who would have the courage to propose it is probably not yet born.

An Opening for Coal Tar.—According to a report from H. M. Consul at Portland (Oregon), coal tar would, but for the difficulty of leakage in transit, be an article of import from the United Kingdom, owing to the superior quality of the article. It has been suggested that, if barrels were packed in damp sawdust, leakage might be avoided. Thousands of barrels, the report says, could be sold annually.

Irish Association of Gas Managers.—Mr. J. G. Tooms, the Hon. Secretary of the Irish Association of Gas Managers, intimates that the annual meeting will take place in the Lynn Hall, Abbey Street, Armagh, on Tuesday, the 16th inst., under the presidency of Mr. James Whimster, of that town. In addition to the President's Address and the consideration of the question of affiliation, there is to be a lecture by Professor Lewes, on the "Carbonization of Coal for the Production of Illuminating Gas," and a paper by Mr. G. Airth, of Dundalk, entitled "Keith's High-Pressure Lighting in Dundalk." It is also hoped that another paper may be arranged for before the date of the meeting. On the invitation of the Directors of the Armagh Gas Company, the members will in the evening dine together at the Beresford Arms Hotel; and on the following day there will be an excursion to Rostrevor.

Coking Test for Coals and Briquettes.—In the "Zeitschrift für angewandte Chemie" Herren Constam and R. Rougeat recently discussed various modifications of the coking test for coals and briquettes. In the modification known as Muck's method, which is much used in Germany, Austria, and Switzerland, 1 gramme of finely powdered fuel is placed in a platinum crucible not less than 3 cm. high, over a bunsen flame not more than 18 cm. high, until no more combustible gas is given off. In the Westphalian coal district, a somewhat different process is generally used, known as the Bochum method. In the lid of the crucible there is a hole 2 mm. in diameter, and the crucible is placed 6 cm. above the burner. The results for yield of coke are decidedly lower than by the first modification, and are more in accordance with those obtained in gas-works in actual working. In the Belgian official method, 1 or 2 cm. are placed in a porcelain crucible, which is covered and embedded in charcoal contained in a large crucible, placed in a gas muffle furnace at about 1050° for half an hour. It is very difficult to obtain concordant results by this method. The American official method was laid down by a Commission specially appointed. Of the coal, 1 gramme is introduced into a platinum crucible weighing 20 to 30 grammes and heated with the full flame of a bunsen burner—the crucible being supported on a platinum triangle. Any deposit formed on the top of the lid is burned off. The loss of weight, after deducting moisture, gives the yield of gas. The three latter methods were found by the authors to give results agreeing satisfactorily one with the other and with those obtained in practice; but Muck's method gives figures for gas which are 2 to 4 per cent. too low.

NORTH BRITISH ASSOCIATION OF GAS MANAGERS.

ANNUAL MEETING IN GLASGOW.

The Forty-third Annual Meeting of the North British Association of Gas Managers was held in the Hall of the Philosophical Society of Glasgow on Thursday last. Mr. D. ROBERTSON, of Dunoon, the President for the year, took the chair at the early hour of half-past ten, by which time there was a very fair attendance of members.

The PRESIDENT expressed his pleasure at seeing the members of the Association gathered together that day, and said he was sure they would have a very profitable and interesting meeting, as they had been promised papers which were full of instruction. Meetings such as these were good for them. They came as a refresher in the midst of what he might term their leisure time, after their hard winter's work, and before they began the next. For everybody a little leisure was good; and they were occupying that short interval in the midst of theirs to devote their attention to subjects of interest to them all.

REPORT OF THE COMMITTEE.

The SECRETARY (Mr. R. S. Carlow, of Perth) read the report of the Committee, as follows:—

The Benevolent Fund in connection with our Association has been drawn upon this year, a donation of £5 having been granted by the Committee to one deserving case.

The Committee, in terms of Mr. J. Napier Myers' suggestion at the last annual meeting, have made inquiries regarding the adoption of the standard meter unions, recommended by them a year or two ago. The Committee have pleasure in reporting that, from information they have received, the standard meter unions recommended have been almost universally adopted, with the exception of a very few cases, where towns have a standard coupling of their own.

The Committee have to report, with reference to the proposal to publish Mr. W. Young's communications, that Mr. Young was approached on the subject, and was very pleased indeed to hear that the Association were to publish in book form all his communications to the Association. Mr. M'Gilchrist and the Secretary sent him reports of the Association, so that all his papers might be compiled together. Mr. Young wrote to Mr. M'Gilchrist on July 6 last as follows:—"I am sorry that I have not been able to do anything to the preparation of the matters necessary to the publication of contributions to the Gas Associations. I have had a call from Dr. Daniell in regard to the matter since I wrote you, but meantime I am afraid the publication must be in abeyance till I feel better able to do the necessary work." You will therefore see that the Committee cannot proceed any further until Mr. Young improves in health.

Your Committee had a number of communications with the Institution of Gas Engineers on the subject of the affiliation of the Institution with District Gas Associations. Your Committee gave these communications their careful consideration, but unanimously resolved not to affiliate with the Institution of Gas Engineers.

The Committee unanimously recommend that the following two gentlemen should be elected to be honorary members of the Association: Mr. Adam MacPherson, of Kirkcaldy, and Mr. Alexander Smith, of Aberdeen.

The SECRETARY also submitted the roll of membership. During the year three ordinary members had resigned, and one extraordinary member had died. The following new members had joined the Association:—

Ordinary Members.—Currie, D., Campbeltown; Currie, J., Nitshill; Ireland J., Auchterarder; *Keillor, J., Peterhead; *Lang, J., Fraserburgh; Marsball, W., Largs; *Milne, S., Aberdeen; Mackay, Alex., Montrose; MacLeod, A., Dawsholm; *Smith, Alex., Tradeston; Thomson, A., Inverness; *Webster, J., Provan.

Associate Members.—Deans, J. R., Gas-Works, Paisley; Irvine, D., Gas-Works, Kirkmalloch; Fairweather, C., Gas-Works, Kilmarnock.

Extraordinary Members.—Dempster, R., Manchester; Penman, R. R., Glasgow.

Honorary Members.—MacPherson, Adam, Kirkcaldy; Smith, Alex., Aberdeen.

The membership of the Association is now: Ordinary members, 154; associate members, 13; extraordinary members, 56; honorary members, 9.—Total, 232. This represents an increase of five.

Mr. W. EWING (Greenock) moved the adoption of the report.

Mr. W. FAIRWEATHER (Kilmarnock) seconded the motion, and it was carried.

Mr. JOHN BALLANTYNE (Hamilton) said he was sorry he could not move the adoption of the report; but he could come there as an outsider, at least, to enter his protest against the decision of the Committee in connection with affiliation with the Institution of Gas Engineers. All other District Associations, so far as he knew, allowed their members to say either "Yes" or "No" to this question; but, strange to say, the Committee of the North British Association seemed to take upon themselves to decide the matter entirely on their own responsibility, without submitting it in any way to the opinion of the general members of the Association. Now, he thought this was a mistake. The decision of the Committee might be right or it might be wrong—he was not at that time going to question it—but still he felt that, as an Association, all the members should have been consulted in some way, say, by circular, as the other Associations had been, thus allowing the members to express an opinion in a proper and formal way. So long as they remained disunited as they were, under separate Associations, each acting on its own account, and on its own behalf, they should never have the influence they might have if they were affiliated—say, in connection with affairs before Parliament. And, as most of them were aware, Parliament seemed at the present time to be taking a very high hand in questions affecting the gas industry—as, for instance, the damage done to main pipes in connection with electrolysis. A protest coming from one body representing the whole industry of the country would have a far greater effect. The remark was made in another place recently, he continued, that they seemed to think the Gas Institution simply moved in this matter for the sake of getting members. He entirely disagreed with this view. He did not think it meant much to the Institution whether they got members from the North British Association or not, or any other Association. The Institution had a large membership; it was one quite sufficient, he had no doubt, for all their purposes. He rather thought their principal aim was to have an affiliation so that a question such as he had referred to, which required a united voice and opinion, could be brought in a proper manner before the proper authorities. He had to enter his dissent from the finding of the Committee in coming to this conclusion without consulting the whole of the members.

The PRESIDENT: Have you any motion to make?

Mr. BALLANTYNE: No. I simply want to express my difference of opinion from the finding of the Committee.

Mr. J. KINCAID (Kirkcaldy) asked if the President could not give the members some of the reasons which led them to their decision. He thought they had not been as courteous as they might have been to the Institution of Gas Engineers. Certainly, the members should have been consulted in this important matter. Perhaps the President might enlighten them a little.

The SECRETARY (Mr. R. S. Carlow) read a letter from Mr. W. T. Dunn, the Secretary of the Institution, to him, dated Nov. 11, 1903, and his reply; and said that contained his instructions. The letter was dictated to him. The Committee gave no reason. Different points were discussed at the meeting; but those were his instructions.

The PRESIDENT said they had heard the correspondence, which seemed to him to be quite straight. There was nothing to be ashamed of. They were not standing on their defence at all. He took credit for the decision himself, and thought they did the right, and only, thing. They were approached as a District Association, and were asked to affiliate. They appreciated to a certain extent the request made to them, and gave it full consideration. They did not wish to alter the constitution or status of their Association in the least, nor to detract from the importance of the Institution of Gas Engineers. Their decision was come to in a straightforward, thoughtful way, after giving every consideration to all the *pros* and *cons* of the question. They sent in their reply; and no one could accuse them of discourtesy. The letter was certainly short; but they were not bound to give reasons. These reasons were quite sufficient to themselves; and he hoped they would be for the members. (Applause.) He put the case of the Committee in this way; and he would have them remember that the decision they came to was arrived at unanimously. There was no difference of opinion; and this should go some way with the members. There were different ways of looking at a question of this sort. Of course, it was clearly the interests of the Association that the Committee were considering; they believed these interests would be best served by not affiliating. One point which weighed very strongly with them was that they were practically the parent Gas Managers' Association. They were the first; and they were approached by the Institution as a District Association. He denied that they were a District Association. They were the representative Association of Scotland; and were approached by practically a new body—only two years or so old—and asked to affiliate without any information. They were asked to do this in a bare circular, which gave no details of objects and aims. Before considering the question at all, the Institution ought to have given them a great deal more information. He allowed everyone who differed from him credit for being sincere; but, at the same time, this did not detract from the wisdom and importance of the decision come to by the Committee. Another point he wished to put before them was that they, as a Committee, were not bound to consult the members at the wish of any outside body. They had the discretion of putting it before the members at the proper time; but it was for the members to decide themselves whether they wished to be consulted on a given point. He was quite willing to take a motion from any member that the matter be remitted back to the Committee with power either to circularize

* Transfers from the list of associates.

the members or to call a special meeting to settle the question. He thought this was as much as he could do at present. But the Committee took no blame; and he himself rather took credit for having done the best that could be done.

Mr. WILLIAM EWING (Greenock) said the motion had been seconded before Mr. Ballantyne spoke. Was it in order to hear him now?

The PRESIDENT said he did not wish to stick to too hard-and-fast lines in a question of this kind. He thought the dissenting members, as he might call them with all respect, might be allowed an opportunity of stating their views.

Mr. LAWRENCE HISLOP (Uddingston) said he understood that in the few remarks the Chairman had made he said the decision of the Committee was given as unanimous. He thought this was a slight error.

The PRESIDENT: It is not.

Mr. HISLOP (continuing) said he, for one, was strongly in favour of affiliation, in which statement he thought the rest of the Committee would bear him out. Although the Secretary was instructed, it was only by a majority. On the other hand, the President had omitted to tell the members that he got a very fair opportunity, as President of the North British Association, to attend a meeting in London.

The PRESIDENT: Yes; I forgot to mention that.

Mr. HISLOP said he did not accept the invitation; and the decision was come to without either giving consideration or listening to their arguments in any way—in fact, the decision was arrived at through the Committee being led by one strong man.

The PRESIDENT: I must call Mr. Hislop to order. The Committee were led by no strong man. Each member of the Committee was a strong man in himself; and they declined to be led by any man.

Mr. HISLOP said that did not detract from the facts of which he spoke. He thought the President should tell the members about the invitation to London. Would he not read the letter from the Secretary of the Institution asking him to go and meet with the other Presidents of the District Associations?

The PRESIDENT said he would make the explanation, which he was sorry he had omitted in his earlier remarks. After the reply was sent to the Institution, Mr. Dunn, the Secretary of the Institution, wrote him again, stating that the Council of the Institution were to hold a meeting in London, and had invited the Presidents of the District Associations, and hoped that he would find it convenient to be present to discuss the matter of affiliation. Well, it was brought up so very recently after their Committee's decision, which was, as he had told them, unanimous, that he consulted all the Committee—wrote every member asking his opinion. He did not want to do anything on his own responsibility, without first consulting the Committee. The majority of the replies he received were in favour of his staying at home. This quite coincided with his own opinion. He did not state his views when he wrote; so the members did not know what he thought. But they quite agreed with what he had previously made up his mind to do unless he was advised otherwise. He wrote what he considered was a very courteous letter to the Secretary of the Institution, pointing out that he did not see any good purpose he could serve by attending the conference, as his Committee had unanimously agreed not to affiliate. He therefore begged most respectfully to decline the invitation.

Mr. J. W. CARMICHAEL (Barrhead) said he wished to corroborate all that the President had stated in connection with the business of the affiliation scheme. There was no doubt that they had just a bare request to affiliate, and had no details given them of the advantages they were to receive. He did not wish to prolong the discussion; but he was very much surprised indeed that his friend Mr. Hislop had such a short memory. There was no doubt that the Committee's decision was unanimous. He considered the best way to overcome the difficulty would be to propose a motion that it be remitted back to the Committee for reconsideration.

Mr. HISLOP said, as a member of the Association, he begged to move that it be remitted back, with a recommendation to circularize the members and get the feeling of the Association in general as to whether they were in favour of affiliation or not.

Mr. WILLIAM M'CRAE (Falkirk) said he had much pleasure in seconding.

Mr. BALLANTYNE said he was afraid the motion was too late. It should have been settled sooner.

Mr. HISLOP said he thought the chance was still given them up till Dec. 31, under the rules of the Institution.

Mr. BALLANTYNE: Yes; but the general meeting is past now. There is no general meeting before next year.

Mr. HISLOP: There is a meeting of the Council, who have full powers to deal with the matter.

Mr. BALLANTYNE: The Council will not settle it.

The PRESIDENT: Mr. Hislop has made a motion that this matter be remitted back to the Committee. This is seconded by Mr. M'CRAE. Is there any amendment?

Mr. JAMES RENFREW (Longbank), said he begged to move, as an amendment, that the matter be dropped. They were in the hands of their Committee; and if they had no trust in them, he did not know who they were to have trust in.

Mr. R. MUIR (Galston) seconded.

The PRESIDENT said they had a motion to the effect that the matter relating to affiliation be remitted back to the Committee, with power to circularize the members asking their opinion on the question. They also had an amendment that the matter remain as at present.

On a show of hands, twenty-eight members voted for the amendment, and eighteen for the motion.

The PRESIDENT said, with regard to the business arising out of the report, there was the question of meter unions. It had been a long drawn-out subject; and Mr. Myers had hammered at it for many a long year. He was glad to say, however, that the agitation had had a most successful result. They had written to all the meter makers asking them for particulars as to the extent of adoption of this standardization of meter unions; and they got back a very favourable reply, telling them that practically all meter users were adopting the standard unions, except in a few cases where they had a standard of their own. He thought this result was most satisfactory. With regard to the printing of Mr. Young's paper in book form, they had done what they could; but, unfortunately, Mr. Young was not in very good health at present, although he was quite agreeable to their proposal, and hailed it with delight. Still, he felt that his own strength was not sufficient to carry out the publication of this work in the meantime. They were all very much indebted to Mr. Young for his very generous offer. He undertook to meet the greater part of the cost of the work, and as soon as possible it would be put into the hands of the members of the Association. He thought they should accord to Mr. Young a very hearty vote of thanks for the interest he had shown in the Association.

THE AUDITOR'S REPORT.

The AUDITOR (Mr. R. B. Main, of Glasgow) submitted his report upon the accounts. He said the General Fund charges were £122 9s. 2d.; and there was a balance of £14 4s. 11d. The Benevolent Fund amounted to £325; and the Research Fund to £150. He thought they might congratulate themselves on the very healthy condition. There was an increase, taking the funds all over, of more than £40. This was exceedingly satisfactory; but, at the same time, as he stated last year, the Benevolent Fund would stand a still further increase. It was true that very few members had applied for assistance from the fund; but the fact remained that if any unfortunate cases were to come up, the fund was not by any means strong enough to be of any really tangible benefit. Last year he said they should aim at having a Benevolent Fund of £500. It was now at £325, which was a very satisfactory increase. He bore testimony to the excellent way in which the accounts were submitted by the Treasurer.

The report was adopted.

Mr. JAMES RENFREW said he had always understood that the Benevolent Fund was to be administered at the rate of £10 a year to deserving or needy members or their widows; but he found there had been a vote of £5 in one case. He moved that this party, whoever it might be, should receive £10.

The PRESIDENT explained that cases which came on the Benevolent Fund were private ones. They did not wish to speak upon them at all. When a person required assistance, naturally he did not wish his affairs to be discussed, even in semi-public meetings; and there was quite sufficient reason for limiting the sum in this case to £5. The original proposal was to give £10; but from further information (which, he might say, had no reference to any shortcomings on the part of the recipient), the Committee decided that in the meantime—and in the meantime only—they should limit the sum to £5. He asked them to accord a very hearty vote of thanks to Mr. Main for his services.

Mr. MAIN acknowledged the vote.

INAUGURAL ADDRESS.

The PRESIDENT then delivered his address, as follows:—

Gentlemen,—In addressing you to-day, my first duty is to thank you for the honour you have done me in electing me President of this Association. It is an Association which deserves well of the gas industry, as it was the first regularly organized body of gas managers devoted to the encouragement and advancement of all matters connected with gas engineering and manufacture, having been established, as set forth in the first clause of its rules and regulations, to facilitate the exchange of information and ideas among its members.

To what extent this object has been attained, is, I think, apparent to all; and one has only to scan the long list of papers read and discussed at the meetings to fully appreciate the good work done. A remarkable feature of these papers is that, while they vary both in quality and subject-matter, they all treat of questions so closely related to our profession that we are bound to rub against them at some part of our career as gas managers; and it would be next to impossible to select from the list a single paper which would not even now be worth perusal. Many brilliant minds have contributed to the papers, men whose achievements in gas engineering are world renowned; and humbler men have also given expression to their ideas in papers singularly practical and well reasoned. Moreover, it is the proud boast of our Association that its portals are wide open to admit the managers of the smallest gas-works along with those of the largest. We are all soldiers of the same army—some commanding an army corps, others only a company, but all animated by the same spirit of earnestness in the cause of gas lighting.

In these days of technical associations and presidents' addresses,

it is becoming more difficult for an ordinary President such as myself to present matter for consideration which has not already been treated of elsewhere, and probably in finer style than is possible with me. But, if you will bear with me for a short time, I will endeavour to address you as a brother manager who takes a keen interest in gas affairs; and though, as regards my address, I might feel inclined to say with the poet—

"Perhaps it may turn out a song,
Perhaps turn out a sermon."

I shall feel somewhat disappointed if it turns out either the one or the other.

I think we may congratulate ourselves on our choice of a profession. Speaking from my own point of view, I do not know another occupation which conduces more to engender feelings of responsibility and self-reliance, or one in which a man who aspires to be a successful manager has such a wide field in which to put into practice his knowledge of engineering, chemistry, and mechanics. I do not say that gas managers have what is called an easy job; we know that it is not so. But apart from the general hard work, and the sometimes inadequate remuneration for such work, there is a certain satisfaction in knowing that we stand alone, responsible for the efficient lighting of our several districts, and occupy, as it were, a position of "splendid isolation," to quote a once famous phrase. Doubtless, at times, when days are dark and nights are long, we would rather the isolation were a little less pronounced, and the splendour somewhat accentuated; but after the usual hard tussle with the difficulties which beset life in a gas-works in winter, we invariably emerge from the struggle triumphant, though with an extra wrinkle or two and a few more grey hairs.

Many important questions are engaging the attention of gas engineers at present; the chief among these being retorts and retort-house machinery, the extension of the use of gas for cooking, heating, and motive power, and the improvement of street lighting by gas. The question of retorts and the distillation of coal has always been a fascinating study for the gas engineer, for it appeals to him at the very beginning of his work; and without proper attention on his part to this department, he had better seek fresh fields and pastures new. We must all be impressed with the fact that William Murdoch should have hit upon a method of distilling coal, which up to a recent date had not been improved upon. I refer, of course, only to the system of charging and drawing retorts periodically, and not to the composition and setting of the retorts, nor the improved means of heating the settings. Doubtless the introduction of fire-clay retorts admitted of higher heats and an increased yield of gas. The adoption of regenerative furnaces also led to greater economy of fuel. But Murdoch's main idea has been adhered to with only slight variation until lately.

To many of us the ideal retort is one which will receive the coal at one end and eject the coke at the other, continuously distilling gas from the coal in its passage through from inlet to outlet. But, unfortunately, the ideal is sometimes very far removed from the practical; and it may be that we shall have to wait some time yet before the ideal can be realized. Many attempts have been made to achieve this object; but hitherto all have fallen short of success. The Settle-Padfield retort is the nearest approach to continuous distillation at the present time, and so far it promises well; but it has yet to be weighed in the scales of practical working and commercial results. Retort-house machinery is a subject which appeals to only a small proportion of our members. This, of course, is owing to the fact that many of the works managed by them are not large enough to employ this class of machinery profitably; for unless machinery can do work as efficiently and economically as hand labour, including all charges for interest and depreciation, its adoption is not to be recommended.

For certain operations about a gas-works, such as driving exhausters, scrubbers, &c., the advantages of mechanical power are so obvious that no one in his proper senses would question its utility; but for coal breaking, coal and coke conveying, and drawing and charging retorts—operations which can be performed quite as efficiently by hand labour—it becomes a question of finding the border-line of output under which it is not profitable to employ machinery. The use of gas for cooking, heating, and motive power has made satisfactory progress during the past few years; but it seems to me that we are only entering into this business, and, great as is the work done in this field at present, it will, before many years are over, have increased fourfold.

Take the case of cooking stoves alone. Many towns in Scotland have not yet begun hiring stoves to consumers, and without hiring, at the outset at any rate, it is next to impossible to gain a footing. Many consumers purchase a stove after using it for a year or two, who would not do so at the beginning; for it is only after lengthened trial that they fully appreciate the comfort and convenience of gas cooking. Other undertakings that have entered into the work with spirit and energy are doing very well and are likely to do better; and it is astonishing how varied is the success of different undertakings in this way. Some concerns hire stoves to as many as 60 per cent. of their consumers; while others struggle along with a modest 2 per cent. But the greater number of those who push the business can now count about 25 per cent. of their consumers among users of gas for cooking purposes. There is no reason why the proportion should remain at the latter figure; and as every additional cooker hired is an advertisement to some one else, and as once a household begin to use a cooker they seldom discard it, I feel assured that it is only a question of a few years when the gas cooking-stove will be a necessity in every home. I am pleased to know that certain architects are specifying combination coal and gas ranges; for it seems a great waste of time and material to fix an expensive coal-range into a house in which the bulk of the cooking will probably be done in a gas-cooker hired from the gas office. While we are considering this subject, perhaps some word of acknowledgment is due to the makers of gas heating and cooking appliances for the assistance they have rendered to gas undertakings in this branch of business; for without the careful attention to details, and the enterprise displayed by them during the past ten years, the progress along this line would not have been so great.

Street lighting by gas has not hitherto received the attention it deserves; but signs are not wanting that public authorities are becoming more inclined to allow gas engineers a freer hand in showing what they can do in this way, and gas need not fear comparison with any other means of lighting. Electricity is its only competitor in street lighting, and for a time it seemed as if it were going to oust gas altogether from the position it had held so long. But the introduction of improved lanterns, fitted with Welsbach burners and mantles and the self-intensive and high-pressure gas systems, have given gas a new lease of life in our thoroughfares. The chief consideration in street lighting is a well-made, wind-proof, lantern—a thing not so easily obtained as one would imagine. Lanterns are sometimes advertised as storm and wind proof which fall very far short of what is claimed for them. Indeed, some of the lanterns which were sent to me lately were so defective that they had to be stuffed all round with rope yarn, to prevent the mantles from being blown away. But there are now wind-proof lanterns in the market, well made and moderate in price; and several of them fitted in my own district are giving every satisfaction. Without wind-proof lanterns, incandescent street lighting is sure to be a failure; for, in most towns, the wind is far more destructive to mantles than the vibration caused by street traffic. It is also my experience that mantles last longer when a pilot light is used and the lighting torch kept out of the lantern altogether. But it is false economy to be overcareful regarding mantles; for if the standing charges against each lamp amount to £3 per annum for gas, cleaning, lighting, and repairs, an additional three or four mantles per season for each is not such a serious outlay, and very often it makes all the difference between success and failure.

To a sensitive gas manager—and there are many such—nothing is more painful than to walk through a town and observe the mantle on every second or third lamp either split up or broken at the shoulder, and sometimes lying a total wreck down on the burner. This leads me to say that, wherever possible, the gas manager in a moderate-sized town should endeavour to get control of the public lighting, because, as a rule, he has a much better knowledge of this branch of work than the other officials who are usually held responsible for it; also, because his reputation sometimes suffers through want of knowledge or carelessness on the part of others, and through no fault of his. Street lighting is a branch of business which gas undertakings should spare no effort in order to retain, for every efficient street-lamp is a standing advertisement of the lighting effect of incandescent gas.

In these days of keen competition, when costs are calculated to the third figure in decimals, it is required of each of us to be on his guard against undue capital expenditure. Nothing militates so much as this against gas being sold cheaply. The pity of it is that the good results obtained by many a manager are seldom properly appreciated, because of the heavy capital charges, which often swamp his very creditable work. For example, take two works in different parts of the country. One has capital charges amounting to 6d. per 1000 cubic feet sold; while the other is burdened with 1s. 6½d. per 1000 feet, and this not through any act of the manager. This state of matters may be ascribed to various causes, such as selling gas at too low a price for a number of years and placing too much to capital; or it may be caused by injudicious expenditure upon new works planned much too large for present requirements; or it may be owing to the character of the district supplied necessitating very extensive distributing plant; or, as sometimes happens at the transfer of an undertaking from a company to a corporation, the arbiter for the company, being a clever man, may be able to state his side of the case more favourably to the oversman than his friend the arbiter for the corporation, with the result that the undertaking changes hands at a price which is at least full value, and the cheaper gas expected by the ratepayers, as a result of the transfer, still looms in the dim future. To illustrate my point, I have here (p. 322) a table relating to eight different gas undertakings. The towns I distinguish by letters; but probably some will recognize them. You will observe that "H," whose price is 4d. per 1000 less than "G," has also to pay 3·78d. less to capital, and that "C," whose price is 2s. 4d., has 11·14d. less to pay than "A," whose price is 3s. 2d. I need not labour the point further; but cases could be multiplied almost indefinitely.

Of late years, a great deal has been said and written about the training of gas engineers. I use the term engineer advisedly, as distinguished from that of manager, for the terms are not always synonymous. The young engineer who wishes to be master of his profession must start at the very beginning, and contrive, by industry and perseverance, to gain that insight of work which a

Town.	Interest and Sinking Fund per 1000 Feet Sold.	Fixed Capital per 1000 Feet Sold.	Net Cost into Holder.	Selling Price per 1000 Cubic Feet.
	d.	s. d.	d.	s. d.
A. . . .	15·47	26 5	15·50	3 2
B. . . .	4·78	8 5	17·53	2 6
C. . . .	4·33	6 8	14·89	2 4
D. . . .	10·85	13 10	17 80	3 0
E. . . .	6·80	7 8	17·51	2 4
F. . . .	6·92	12 4	18·88	3 2
G. . . .	9·88	13 8	20·90	3 4
H. . . .	6·10	8 4	21·77	3 0

person can only acquire in youth; for if he waits until later on, he is then too old to ask for information, and other men never dream of telling him, thinking that he knows already. Technical schools are boons to the youth of the present day, who perhaps do not always appreciate them as they ought. But good as they undoubtedly are for fitting a man for his duties in after life, they are not by any means the be-all and end-all of technical education. We have it from that high authority Sir William Arrol that the best men he puts through his hands are those who work at their trade during the day, but who also attend at technical schools in the evening. They thus carry on at the same time the practical and the theoretical; and the two combined in the same person produce the most capable man. Pure theorists certainly have a place allotted to them in this world; but how seldom does it happen that this place is inside the walls of a gas-works?

The manager, who is often also the engineer, in addition to the foregoing qualifications, must also be possessed of exact business methods, must have a keen eye for a bargain, be attentive to every means whereby business may be increased, and, last but not least, he must have tact. I know it is said that tactful men, like poets, are born, not made, and that it is hopeless to expect a man naturally devoid of tact to be tactful; yet, all the same, I think the virtue can be cultivated. At all events, it is worth while trying, because we all know cases where an ordinary man with tact is a success; whereas, in another case, a man of talent, but without tact, is a dismal failure. Consumers have to be humoured and pleased, and supplied with the article they want; and it is much easier to deal with a pleased consumer than with one you may have contrived to irritate at the commencement of the interview. This reminds me that if I have not yet begun the "song," I am getting perilously near the "sermon."

But, to conclude, What are the prospects of the gas industry? Is it making the progress we would desire, or is it likely to suffer in the struggle with its many competitors? My own opinion is that it has yet a long way to travel before it reaches its zenith. An industry that can show an increase of 60 per cent. during the past ten years must be in a thoroughly healthy condition; and when we think of the many purposes for which gas can be employed—fields which we are only entering upon at present—we cannot but feel confident regarding the future. By adopting the newest and most improved plant as occasion arises, let us seize every opportunity of furthering the use of gas for all possible purposes, and at the same time let us see that we ourselves are keeping abreast of the times, and ready for duty at any time; for in gas manufacture, as in warfare, the most important factor is the man behind the gun.

Mr. CARMICHAEL rose with the very greatest pleasure to ask them to give a hearty vote of thanks to the President for his able and instructive address. Mr. Robertson had touched upon many things of great importance to them as gas managers.

The PRESIDENT thanked the members, and assured them it had been a labour of love to him to prepare the address. If they had enjoyed the listening to it as much as he had enjoyed the writing of it, their pleasure must have been intense.

Mr. W. EWING (of Greenock) read the following paper on

A FEW NOTES ON THE £ s. d. ASPECT OF THE RETORT-HOUSE.

When your President asked the author to allow his name to be put forward for the reading of a paper on the retort-house at this meeting, he was somewhat reluctant, for various reasons, to give his consent. On second consideration, however, he thought it might be the means of creating a profitable discussion were he to give "A Few Notes on the £ *s. d.* Aspect of the Retort-House," where the profit of a gas-works to a large extent is made or lost. It has been truly said by one of varied and undoubted experience in retort-house work that "The man with a barrow and shovel takes a lot of beating." The Past President of the Institution of Gas Engineers recently said, in discussing stoking machinery, that "he had failed to discover any machine on earth which was as good as a man." It is therefore desirable in dealing with the economy of the retort-house or its modern developments to start with the highest unit of efficiency—"the human machine."

It is essential for economical working with hand labour or machine stoking to have a bench of retorts capable of giving a maximum of efficiency at a minimum cost of construction. Opinions differ as to costs and methods of construction. But the author has not changed his view as to the economy and efficiency of a well-built generator setting of retorts, and he has yet to see results from the more expensive regenerator settings which equal or excel those obtained by him, under difficult conditions of working, ten years ago, and given in tabulated form to this Association in July, 1898.

The construction of a bench of 100 retorts on the generator principle on the ground-floor line of a retort-house to manufacture a million cubic feet of gas per day, including all brick and iron-work complete, can be well done for the sum of £24 per mouthpiece, or £2400.

From these settings in Scotland it is possible, under ordinary conditions, to easily obtain 1000 cubic feet of gas per lineal foot of retort, or 10,000 feet per mouthpiece, a million feet per day, 10,000 feet per ton, and have 10 cwt. of coke available for sale. Each stoker would receive 5s. 3d. per shift, handle 3 tons of coal, 30 cwt. of coke, and make 30,000 cubic feet of gas during an eight-hour shift, at a cost of 1s. 9d. per ton from the coal waggon to the coke bin.

The total cost of wages for manufacturing 365 million cubic feet of gas per annum being		£3194
Annual interest, at 3½ per cent. (cost of retort-bench £2400)	£84	
Sinking fund for redemption of £2400 in 15 years . .	160	
		244
Total		£3438

The above figures do not include the cost of ordinary repairs or renewals, which are generally less than those required for regenerative settings.

Generator settings have been found useful for overcoming the water difficulty; and in the author's opinion, a wet producer pit can give working results fully equal to a dry one. Stage-floor settings are in most cases unnecessary and costly; and the modern improvements in machine stoking can now be added at a small cost to any kind of retort-setting on the floor level. At the last meeting of the Institution of Gas Engineers, the President said, in referring to the human *v.* power machine, that "fortunately, a man could change his mind in a few seconds. This was the reason why there was no process of gas making in the world which produced such good action on the retorts and as good coke as manual stoking. Next to this he thought would be Mr. West's manual machine, which he had described; and the further they got away from this, the worse the results were likely to be."

The West manual machine has done good work and has given considerable satisfaction in gas-works capable of keeping it fully employed. There is, of course, a limit to the economical employment of this plant; and, in the author's opinion, two sets of manual machines complete for a make of about a million cubic feet of gas per day should give its highest efficiency, and the cost of carbonizing on the hand labour basis of wages should not exceed 1s. 3d. per ton.

In taking the highest efficiency per lineal foot of retort yet obtained with manual stoking machines at 890 cubic feet, or 8900 cubic feet per mouthpiece, it is necessary to erect 112 single retorts, or 12 per cent. more than the number required for hand labour to make a million cubic feet per day. The reason for this lower make per mouthpiece is found from experience to be due to the pulverizing effect of the coal-breaking machines on soft Scotch coal, which largely increases the quantity of breeze and dust; thereby making the coal more difficult to carbonize, and at the same time reducing the make per ton as compared with hand labour.

The loss in coke per ton of coal carbonized, due to the additional breeze made and the reduced quantity saleable, may be safely stated at 5d.; and the loss of coke due to the heating of an additional 12 per cent. of retorts may be stated at 1⅓ tons per day, which at 8s. per ton is equal to 12s. per day. There is also a loss of about 300 cubic feet of gas, which is equal in value to 6d. per ton. The small yields of sulphate of ammonia and tar indicate a considerable loss in this direction, due undoubtedly to the uncarbonized mass of coal often drawn from the retorts, sending gas, tar, and ammonia through the retort-house ventilators instead of into the gasholders and the tar and sulphate plants. It is somewhat difficult to put a figure opposite the loss from this source; but nevertheless it exists, and the modern gas engineer and manager should put forth his best endeavour to increase the bulk of residuals by improving the plant at his command.

The cost of 112 single retorts on the regenerator principle on a stage-floor with two of West's manual machines complete to manufacture a million cubic feet of gas per day would cost (exclusive of hot-coke conveyors) about £8000, or £71 per mouthpiece. Of course, this figure does not include the extra cost for the increased height of the retort-house wall required for stage-floor retorts as compared with floor-line retorts for hand labour.

Cost of carbonizing 36,500 tons of coal, at 1s. 3d. per ton		£2281
Annual interest on £8000 (cost of retort-bench), at 3½ per cent.	£280	
Sinking fund for redemption of £8000 in 15 years .	533	
Loss of coke due to reduced quantity saleable and excessive breeze made, at 5d. per ton of coal .	760	
Loss of coke due to extra retorts required, 1⅓ tons per day, at 8s. per ton (547 tons)	219	
Loss of 300 cubic feet of gas, at 6d. per ton of coal used	912	
		2704
Total		£4985

The above commercial cost of carbonizing 36,500 tons of coal does not include wages or fuel for steam, nor the cost of oil, waste, repairs, and renewals.

In Scotland, there is a considerable difference between the maximum and minimum output of gas as compared with most English towns. In some parts of Scotland the minimum output of gas during the summer is sometimes about one-fifth of the maximum requirements. Some English towns have practically an equal demand throughout the year; and in some instances the output may vary during the summer from one-half to one-third of the winter requirements.

If two sets of manual-stoking machinery are applied to works with a make of gas varying between 1,000,000 and 300,000 cubic feet per day, the cost per ton of coal carbonized will increase and decrease accordingly. The cost of wages would vary between 1s. 3d. to 2s. 3d. per ton; and the average cost may be taken at 1s. 10d. With hand labour the cost of wages under the above conditions should remain practically the same during the maximum and minimum output.

Power stoking-machines, as applied to the largest gas-works, where they can be kept fully employed, have to a considerable extent solved the labour problem by reducing the number of men and consequently the amount of wages paid. The power stoking machinery generally used is of the West or Arrol-Foulis type, which gives general satisfaction in retort-houses suitably arranged for them. The pioneers of stoking machines deserve the thanks of the gas profession for the energy and ingenuity they have shown in making these machines nearly human in their actions; and I have no doubt the same brains that developed such excellent machinery are now ready to keep ahead of modern improvements by introducing a machine electrically driven which can be economically applied to the smaller works from 50 millions upwards.

The author is a strong advocate of stoking or other machinery in gas-works, where it can be applied to save arduous manual labour without increasing the commercial cost per ton of coal carbonized. Power stoking machinery applied to works manufacturing a million cubic feet of gas per day, or 365 millions per annum, in Scotland would require 112 single retorts, against 100 retorts for hand labour. The cost of this installation on the stage-floor principle, but exclusive of hot-coke conveyors, may be taken at £100 per mouthpiece, or £11,200. Some installations have cost more than the above figure; but I am sure a complete plant can be erected for this sum.

The cost of carbonizing wages per ton of coal in making a million cubic feet of gas per day with power stoking machinery, under fair working conditions, and without hot-coke conveyors, should not exceed 1s. 10d. compared on the same basis as hand labour.

Cost of wages for carbonizing 36,500 tons of coal, at 1s. 11d. per ton		£3498
Annual interest on £11,200 (cost of retort-bench and machinery), at 3½ per cent.	£392	
Sinking fund for redemption of £11,200 in 15 years	746	
Loss of coke due to reduced quantity saleable and excessive breeze made, at 5d. per ton of coal	760	
Loss of coke due to extra retorts = 1½ tons per day, at 8s. per ton (547 tons)	219	
Loss of 300 cubic feet of gas, at 6d. per ton of coal used	912	
		3029
Total		£6527

The above commercial cost of carbonizing 36,500 tons of coal does not include the wages or fuel for steam, nor the cost of oil, waste, repairs, and renewals.

Should an installation of this machinery be applied to gas-works having a maximum daily make of 1,000,000 cubic feet and a minimum of 300,000 cubic feet, the average cost would be considerably increased. The maximum, minimum, and average cost would be (approximately) 3s., 1s. 10d., and 2s. 2d. respectively. These figures all point to the necessity of having sufficient work for any installation of machinery previous to its adoption.

The De Brouwer projector and discharger, which have been successfully applied to several gas-works, are, beyond doubt, the cheapest and most economical stoking plant in the market. The author had some doubt as to its efficiency; but, after watching its operations for two days, he is convinced that it can do everything claimed for it. This machine can be applied to any horizontal retort-setting, and only one set of plant is required for charging and discharging 20 feet through retorts. It is working at Derby on 48 through retorts; and, from experience, it has been found to increase the make per ton as compared with hand labour—the cost of the plant being £1500, and of carbonizing 1s. per ton.

With a machine of such efficiency applied to 48 through retorts 20 feet long, it would be an easy matter with Scotch coal to make a million cubic feet of gas per day. The cost of constructing a generator setting of 48 through retorts need not exceed £24 per mouthpiece or £2304. The cost of plant may be taken at £1500; the total cost being £3408.

Cost of carbonizing 36,500 tons of coal, at 1s. per ton		£1825
Annual interest on £3408, at 3½ per cent.	£119	
Sinking fund for redemption of £3408 in 15 years	227	
		346
Total		£2171

The cost of repairs with the De Brouwer projector is extremely low, and with a make of 300,000 cubic feet per day the cost per ton of coal carbonized does not exceed 1s. 3½d., which gives it a first place for economy in carbonizing coal.

Another important source of economy in the retort-house is the advantage to be derived from dry mains or the use of anti-dip pipes. The saving is stated by some engineers at 7½ per cent.; others say it is 5 per cent.; and one experienced engineer has given it is 2½ per cent. If the average of these figures be taken, and 5 per cent. reckoned as the saving to be effected, it would certainly be an advantage to spend a considerable sum on the plant necessary to accomplish this end.

Discussion.

The PRESIDENT said they had all heard Mr. Ewing's very interesting paper. He did not think there was a subject before them that took up their attention more than the working of the retort-houses and the results obtained from different styles of carbonizing. He hoped there would be a good discussion; and probably Mr. Ewing did not expect to have it all his own way. It would be a pity if he did.

Mr. W. B. M'LUSKY (Perth) said he had very much interest in the subject, and he was certainly indebted to Mr. Ewing for bringing the matter up that day. He wished very specially to thank him for the excellent paper he had given. It was one which had been very carefully prepared. This was quite evident; and the information had apparently been gathered from a very wide field, and was no doubt reliable as being average results—not results only in one district, or in one part of the country, but results which had been obtained with various classes of coal. He was very loth to open the discussion on the subject, as he did not wish for a moment to pose as an authority on machinery, because he really had no machinery in use for charging and drawing retorts. They had manual machines, which were directed by hand labour. He must say, however, that, from his experience of the manual machines, he would certainly adopt power machinery to-morrow if he had as many retorts as would employ the machinery profitably. In other words, he advocated machinery all round from the experience he had had of manual machines. It would be foolish of him to follow Mr. Ewing through all his figures, because they applied to work which he had no experience of. There was one thing, however, that they must all admit, and that was that Mr. Ewing was an excellent exponent of hand labour. There was no denying the results which Mr. Ewing had obtained with hand labour; and he thought he was very well entitled to speak as an authority on the subject. The author had obtained results with the shovel which he was bound to say would be very difficult to beat. To get to facts. Mr. Ewing referred to 1s. 9d. per ton as being the cost he would expect from a bench of 100 retorts at a cost of £24 per mouthpiece. He (Mr. M'Lusky) would consider this very good; and he believed Mr. Ewing had obtained these results. He thought that a stage-floor bench was better for the men. The workmen had more comfort and more light, and did their work much better in clinkering the furnaces. At the same time, a good stoker would do the work probably as well in a cockpit—when they were working on the ground level, it was working in a cockpit—as in a stage-floor. But, as a general principle, he would advocate a stage-floor so far as the comfort of the men was concerned. Again, with the ordinary semi-stage plan, there was difficulty in getting the coke up. Well, a hot-coke conveyor would overcome this; but in a small works a coke conveyor would not pay. What they would save from the stage-floor would just be spent on handling the coke. Therefore, it would be better to spend the money in putting the bench up at once and getting the coke handled; and thus they would be able to deal with a hot-coke conveyor more comfortably and less expensively when it was required. He might say that at Perth they had no hot-coke conveyor. Their minimum carbonizing wages amounted to about 1s. 1d. This was a figure which could only be obtained for probably about six weeks in winter, and was obtained with 100 retorts. Then, coming down to summer working, they could not halve a man; and therefore, when two men would be too little, three would be too many, and they just kept on the three. On this account, carbonizing wages in summer were a little higher, and the maximum was about 1s. 10d. per ton. Now they would expect, if they had a minimum of 1s. 1d. and a maximum of 1s. 10d., the average should be between these two figures. But they had other things to come in. They had 5 per cent. of their total wages bill paid in holidays alone, and they had a little over 4 per cent. paid in sick pay allowance and Sunday rest; and this, with other etceteras brought their average cost up. In regard to the cost of the benches, they in Perth had erected two benches, and, of course, the cost of the material had varied so much between the dates of the two that it was very difficult to make a comparison; but the last bench cost £37 per mouthpiece—a stage-floor bench. The machinery for charging and drawing the retorts cost £15 per mouthpiece; but when this was fully employed, the cost would probably wear down to about £10 per mouthpiece. Therefore, £50 would be about a fair sum to allow for a stage-floor bench, including manual machinery, but not including a hot-coke conveyor. In regard to the wages question, he had to explain that they did not pay 5s. 3d. per shift. They paid stokers who had been promoted to be machinemen 5s. 3d. per shift; but they had promoted labourers to be lidmen. It would hardly be reasonable to promote a labourer at once to receive the same pay as a stoker. Labourers promoted to lidmen received 28s. per week of 52 hours and stokers or machine men received 5s. 3d. per shift.

Mr. WILLIAM FAIRWEATHER (Kilmarnock) said there were some points in the paper he was very much interested in—more particularly in connection with the stage-floor which Mr. M'Lusky had referred to. He had the two kinds in Kilmarnock—the stage-floor and also the underground tunnel, such as they might have in Glasgow—and he found it was a very inconvenient thing for the men, more especially in the winter season. The tunnels were very warm—in fact, he sometimes sympathized a good deal with the men in having to work there. But he found that now they had got a stage-floor everything was nice and clean and comfortable, and the work could be done, he believed, cheaper and with far more pleasure than in the old way. Another point was the cost per mouthpiece being £24. He had never managed to do anything like this. He thought the cheapest they had got, even with their old system, was something like £30 per mouthpiece. The new system, with a stage-floor, cost £50 per mouthpiece; and he considered it was very cheap at that. When they put their railway siding in, and got other arrangements made, he expected they would be able to work considerably cheaper than in the meantime on the old system.

The PRESIDENT said he was a little disappointed at the discussion, because he thought the paper would lead to a bit of a fight relative to the merits of different machine stokers. No one would dream of putting in machinery in a retort-house where two or three men could do the work; it would be like employing a steam-hammer to crack a nut. But, all the same, there were certain machines on the market now which were well worth the consideration of men who could find it profitable to employ them. Mr. Ewing had mentioned the De Brouwer stoking machine, which appeared to be a most interesting invention. It came nearer the human style of labour than anything that he knew. The coal was projected into the retort in much the same way as when thrown off a shovel. It found its own bed as it fell; and, as a consequence, it must lie much easier than when deposited into a retort perhaps in one place and perhaps in another. He did not know that any stoking machine claimed to be perfect in stoking coal into the retort. Some claimed more than they could really perform. He had seen coal thrown with machinery into a retort in a way which if it had occurred in his own place would possibly have resulted in a hot five minutes for somebody. This was a pity, because it damaged the reputation of the machinery. There was no doubt Mr. Ewing had done by hand labour what a great many men, by machinery, could not attain to. It was just a question whether they could all get their men to carbonize 3 tons of coal every day and produce 30,000 cubic feet of gas. They would all like to do it; but there were a great many things they would like to do which they had to stop short of. He would be very pleased if he could get his men to work up to that point of perfection. Mr. Ewing had done it; and it showed that he was a man of remarkable ability.

Mr. EWING, in reply, said he was somewhat disappointed at the discussion; but he knew they had a great many modest men there who were doing even better work than he could accomplish. They did it in silence, however; and only the towns in which they were situated knew of it. There were several gentlemen in the meeting he could name who were doing magnificent work. He should have liked more discussion on the matter, because it was of vast importance at this time, owing to the wonderful changes in their machines—newer machines for the carbonizing of coal. Mr. M'Lusky was an advocate of manual machines under his existing conditions; and he said he would adopt power machinery if his works were large enough. This was always the trouble. As the President had said, it was no use putting in a steam-hammer to crack nuts, or an elephant to do a donkey's work. This was where many mistakes had been made in gas-works. Mr. M'Lusky said 1s. 9d. per ton was a low figure for hand labour. He believed it was often done at a smaller cost than this. It had been done by Mr. M'Lusky himself, he knew for a fact, at a much lower figure; but, of course, the wages were not 5s. 3d. per day. He himself had accomplished it at a smaller cost; and it need not exceed that figure in any gas-works over (say) 40 or 50 million cubic feet, where they could maintain eight retorts going during the summer. Mr. M'Lusky advocated the stage-floor system. No doubt it was an advantage under certain conditions; but were he (Mr. Ewing) erecting a retort-house to-day on a large scale, he would put up units of (say) 3 million feet to separately deal with a million cubic feet; and he would thus watch the operations of the men in each million cubic feet. One million cubic feet per day was worthy of an expert overseer, knowing, as he did, that in making this quantity, they might lose £20 or £30 a day. He would erect the retorts on the generator principle, as by this means he had obtained results that had not been surpassed by regenerator retort-settings. He could do it to-day at from £20 to £24 per mouthpiece. On the ground floor, with a De Brouwer projector, the results would be much better than anything that could be attained by hand labour. No doubt the stage-floor was an advantage in many ways. But in dealing with retort-houses of (say) from 200,000 up to 600,000 cubic feet per day, the quantity of material in the way of coke was so very small; and in a well-aired retort-house the work could, in his opinion, be even more comfortably done on the ground floor than on a stage floor. The fumes from the coke had always a tendency to strike against the bench and to travel up the house. He had seen retorts drawn without a particle of smoke. He had seen a man draw two retorts and charge two retorts within ten minutes. Where was the machinery that would do such work? If they took their men singly, and apportioned them over any labour, he thought there was no machinery on earth that could do it. The machine had to travel right along the whole bench; but each man had a unit of work and a unit of efficiency in himself. Of course, Mr. M'Lusky's minimum figure of 1s. 1d. per ton was a very low figure indeed; and Mr. M'Lusky had accomplished, with his manual stokers, work that would take a lot of beating. But, of course, he (the speaker) stated that there was a disadvantage owing to the smaller make during the summer. It was a disadvantage nearly everywhere; and it was a big advantage in some works. Mr. M'Lusky said that his new bench had cost only about £50 per mouthpiece. It must, however, be remembered that Mr. M'Lusky had accomplished work there "off his own bat;" he required the services of no expert. He fitted up a bench there—the finest bench of retorts that he (Mr. Ewing) had ever seen—at £50 per mouthpiece. It was a record. If they called in experts for this class of work (which was necessary under certain conditions), when the gas manager either was not capable or had not had the needful experience for devising the setting of retorts suitable or erecting machinery, it was absolutely necessary to put themselves in the hands of experts. Those experts must, of course, be paid; and they would be fools if they did not have £20 a mouthpiece, because they took the responsibility off the manager's shoulders. In this case, Mr. M'Lusky had been his own expert. Mr. Fairweather was also an advocate of stage-floor settings; and he had recently erected plant that was worthy of imitation. The cost was one of the lowest on record; and he believed the results now attained were really excellent. His retort-house was on the stage-floor principle, which no doubt suited the class of retort-setting employed—the Siemens. And he had hitherto got splendid results. They only required to look at the amount of coke sold, the quantity of gas sold, and the price of it. These three items were most important in judging what a man was really doing in his retort-house. The President was an advocate of the man with the barrow and shovel; and no doubt he had good reason for being so. Mr. Robertson was one of those modest individuals who did excellent work—managed his gas-works as they should be managed, and said little about it. He did not go everywhere and boom all the results he was getting; but he was obtaining really magnificent working results in the works of which he was at present Engineer and Manager. In conclusion, he (Mr. Ewing) said it was the duty of every gas manager and engineer to do everything at the smallest possible cost consistent with efficiency, and to secure the highest possible result from a ton of coal. This was not always done. It was not the elaborate works that gave such results; it was the modest moderate-sized town works, where they had to look for the excellent working result.

Mr. J. W. NAPIER (Alloa) read a paper as follows:—

THE ILLUMINATING POWER AND CALORIFIC VALUE OF COAL GAS, HAVING REGARD TO CONSUMERS' INTERESTS.

The interest and attention of the whole gas industry are at present concentrated on the important problems concerning the policy of our work and profession. Past experience and practice will be of advantage so far as they may be helpful in guiding our course of action for the future. The times are pregnant with great changes; and we are conscious of the stern necessity of, if such be possible at the moment, focussing in our minds a correct conception of our duty as sellers of light and heat. The monopoly of the past is but a recollection, and the advent of competition, together with changed conditions of the consumers' demands, are compelling forces requiring our most serious consideration. It is of some importance to note that in all directions where the application of power is needed in our manufacturing industries, fuel in the gaseous form is rapidly attaining a foremost position, and will have a first place in preference to fuel in the solid or liquid form.

I have felt compelled to give this contribution, in view of the fact that no paper for some very considerable time has been included in our "Transactions" dealing with the pure question of what quality of gas is best and cheapest in the consumers' interests. This communication is only preliminary, and is not to be taken as dealing exhaustively with each and every phase of the subject, either commercial or manufacturing. In Scotland, the general practice in the past—at least within the last few years—has been to supply what has come to be termed a high-quality gas, in contradistinction, doubtless, to the lower candle-power gas supplied in England and most other countries. The popular explanation of our "individuality" in this matter, and as bearing on the condition of things existing for many years, lay in the fact that cannel coal was abundant and readily available. High-quality gas, as peculiar to Scotland, has been looked upon by outsiders as an apparent conservatism, and having no rightful excuse for its practice. We are aware that enrichment by cannel coal has been carried to an extreme; but happily the trend of events has necessitated, as it has now brought about, at least within measured lines, that our practice should be in the direction of supplying gas of a lesser illuminating value.

This question of illuminating power has been a strongly political one—indeed, a somewhat disturbing feature, in the gas

affairs of Metropolitan and other companies in the South. There, with but few exceptions, the tide has flowed full and strong towards a reduction in lighting value. Generally speaking, the reduction in quality made by gas undertakings in the South has been from about 2 to 3 candles. What have we been doing in Scotland in this respect? It can be shown that similar—indeed, in some instances, even greater—reductions have taken place. Having ascertained the quality of gas supplied by works in Scotland five years ago and now, we have the following statement:—

Candle Power.	Number of Works. 1898.	1903.	Candle Power.	Number of Works. 1898.	1903.
32	5	3	24	19	37
30	10	11	23	6	21
29	8	5	22	3	17
28	41	17	21	3	9
27	35	23	20	—	5
26	45	25	18	—	1
25	48	56			

These figures, it must be noted, are taken from published returns—the only readily authentic means at hand. On further looking into the matter, I find that the higher quality gas is supplied mostly by works of a less size, and that the lower candle values obtain in the larger works, which for the most part are situated within the coal-field region.

It is now necessary to consider the diversified purposes to which our consumers make use of our product. In the demand for light, the incandescent burner has been a powerful factor; the efficiency of the mantle depending on flame temperature. Cooking and heating have made a hurried march into the domestic affairs of the people. As a motive power, gas has made rapid progress; and having regard to its ease of distribution, and its relatively higher heating value compared with all other gases of thermal efficiency, it is needless to say that herein lies an important field of development.

For evidence of the changing conditions of gas supply, I feel I cannot do better than refer to the actual experience in Alloa, as shown in statistics carefully kept over a number of years, and are a correct record of the Corporation gas supply.

Consumption of Gas during the Months of April, May, June, July, August, and September (Summer Months).

Year.	Day Consumption. [6 a.m. to 6 p.m.]		Night Consumption. [6 p.m. to 6 a.m.]	
	Cubic Feet.	Per Cent.	Cubic Feet.	Per Cent.
1893	1,182,600	9·58	11,166,200	90·42
1894	1,756,700	15·84	9,333,500	84·16
1895	2,488,700	19·56	10,232,600	80·44
1896	3,304,400	21·86	11,809,100	78·14
1897	4,683,500	26·48	13,003,400	73·52
1898	5,275,400	28·95	12,945,300	71·05
1899	6,661,800	31·26	14,646,400	68·74
1900	8,459,000	34·93	15,755,900	65·07
1901	12,861,900	41·89	17,840,200	58·11
1902	13,894,900	43·09	18,345,100	56·91
1903	15,493,400	44·53	19,303,500	55·47

Taking the last year's results, the total amount of gas sold over the whole year amounted to 83 millions (approximate). Consequently, the consumption during the six months' period under consideration was equal to 42 per cent. of the total year's sales—and this comprising the short-hour lighting months. I have endeavoured to ascertain the extent to which incandescent lighting was used during that period. This involved considerable labour; and having regard to various circumstances, I find that practically 34 per cent. of the gas used for lighting is with incandescent burners. We have accordingly the following further statement:—

Heating, cooking, and power	44·53 per cent.
Heating—incandescent lights	18·86 ,,
Add proportion of gas used after 6 p.m. for heating, and not previously included	5·00 ,,
	68·39 per cent.

Doubtless, in the experience of others, much higher figures can be shown.

It is evident that what we are called upon to supply is not a lighting, but a fuel gas. For besides the gas used for heating purposes and power, is not the gas required for the mantle the same? Therefore, for power distribution to manufacturing works, for heating in a great variety of ways, for cooking in the domestic services, and for heating efficiency in order to yield light by mantles, our product is eminently a fuel gas. Incandescent lighting has been tardy in its progress; and the public hitherto have been somewhat unwilling to foster its growth. As has been frequently repeated, incandescent lighting on the Continent practically usurps the place of the common burner; mantles being used to an extent equal to absorbing fully 90 per cent. of the total gas supplied for lighting requirements. While with us the same progress cannot be noted, it is a matter of common observance that incandescent lighting is increasing very rapidly. If it be true that in the march of progress the mantle has brought about this cry for the lowering of quality, then we may expect, as the public become more educated to the necessity of using gas to the possible advantage, the ultimate extinction of flat-flame burners, and a wholesale use of mantles, this momentous time will be reached. How soon it is difficult to say; but the consummation will be arrived at all the more quickly if we direct our efforts and apply our energies in the direction of educating the consumer. In this matter, much has been left undone.

The condition of affairs, so far as the common practice of the consumer is concerned with flat-burners, is best seen if we look closely into the results actually obtained. Burners taken at random from consumers' premises, on being tested with 22-candle gas, were found, as regards 50 per cent., to yield 18 candles, 15 per cent. yielded 14 candles, and the remainder, from 10 to 12 candles per 5 cubic feet. This much has to be said, that frequently the burners in use are totally unfitted for consuming the quality of gas being supplied. All flat flames are not bad; but when we attempt to analyze these results, we are at once confronted with the enormous waste of lighting energy that is going on. Remembering, from the statement already adduced, that 66 per cent. of gas used by consumers in my own particular case is burnt by means of the ordinary jet, we are at perfect liberty to deduce the following: The 66 per cent. of gas so used yields to the consumers an average value (presuming the best result to be obtained) of fully 4 candles per cubic foot, while the average value obtained by the remaining 34 per cent. would certainly be not less than from 15 to 25 candles per cubic foot. Either we must take up the position of supplying the consumer with the very best type of flat-flame burners, or else discountenance their use altogether. The real interests of the individual consumer begin and end when he has obtained the very best result possible. There is no questioning the fact; and it should not be necessary to unduly labour the point. But to put it briefly, the flat-flame consumer is paying a high price for the comparatively low value obtained. No business transaction between buyer and seller can be economical to the purchaser if the value of the article is depreciated by improper use. We only require to glance for a moment at the results obtainable with mantle *versus* flat-flame lighting, as affecting the pocket of the consumer, to see the extent of the depreciation in the case of many of our consumers.

	Candles per Cubic Foot.	Cost to Consumer per 1000 Candles. Gas at 2s. 2d. per 1000 Cubic Feet.
High-pressure incandescent	30	0·85d.
Ordinary incandescent	20	1·30d.
Flat-flame	5	5·20d.

Of what use is it to keep up the quality by 2 or 3 candles at considerable cost when the consumer can have an increased lighting effect, four times greater in the proportion of 20 to 80 candles, and this by supplying a common coal gas?

Having, so far, obtained a correct conception of our duty as suppliers of light, it is quite clear that under these conditions the furnishing of a high candle-power gas—by which is meant gas produced from common coal enriched with either cannel or oil to any given candle power beyond that yielded by the coal alone—is undoubtedly an extravagance on the part of the gas producer, and a direct encouragement to the consumer to cease advancing with the times. Unhesitatingly, we ask ourselves the question, Why should the consumer, who is sufficiently intelligent to realize in practice the best method of getting the highest value from the gas, be taxed, owing to the stand-still attitude of those who decline, or at least are unwilling, to realize the financial and material benefit awaiting them?

Parenthetically, I may be permitted to remark, as a result of personal observation, and as bearing on the question of low *versus* high quality gas supplied in different centres, that comparing London, Manchester, Leeds, Sheffield, and a few other towns, as regards public lighting more especially, these places are incomparably better lighted than (say) Edinburgh, Glasgow, and, indeed, many of our other towns; the candle power in the places first named being on an average 14 to 18, compared with 20 to 25 in those last referred to. Even where flat-flame burners were in use, to me the result obtained was quite surprising, and in every way compared satisfactorily with those oftentimes exhibited with high-quality gas. This is a matter for considerable reflection on our part, and indicates quite clearly the gulf existing between illuminating effect and the mere term illuminating power as judged by the consumer.

Let it be admitted, once and for all, that the incandescent burner is the best possible medium for the consumer to acquire satisfactory and economical lighting by gas. We admit, and readily so, that any material reduction in quality would have a serious effect on the light-giving power of ordinary burners. I am anxious that every true consideration should be given to all classes of consumers; and in this matter I cannot do better than quote from the evidence of Professor Percy F. Frankland, who appeared on behalf of the London County Council, before the Committee on Metropolitan Gas Testing. As the result of experiments with flat-flame burners, and using 14·4-candle gas, he found that 1348 cubic feet would require to be consumed in order to yield the same amount of light as 1000 cubic feet of 16·5-candle gas. This represents a necessarily increased consumption of 34·8 per cent.—a very alarming figure from the point of view of the consumer. But there is a certain fallacy in attaching too much (if, indeed, any) real value to this result. The law of improbability comes into force; and, as practical men, we ought not to consider the result as at all likely to pertain in the actual everyday requirements of consumers. We are producers and

sellers of light in so far as we are dependent on the individual using, in the most scientific and efficient manner, the gas we distribute. As the result of the reduction in quality which doubtless most of you have had experience of, to an extent greater than 2 candles, have you found that anything like a 34 per cent. increase on consumers' bills has taken place?

I have compiled the following brief statement, taking the experience of towns where a distinct reduction in quality has occurred:—

Town.	Candle Power.		Reduction.	Consumption per Consumer.	
	1898.	1903.		1898.	1903.
1	25	23	2	17,220	16,470
2	25	22	3	22,300	24,200
3	25	21	4	10,000	10,550
4	24	22	2	17,560	17,770
5	23	20	3	14,470	14,870
6	23	21	2	17,470	18,800
7	25	21	4	17,550	15,910
8	24	20	4	11,070	11,140
9	24	22	2	17,790	18,610

I am conscious that several disturbing factors may have been at work in preventing the above statement being absolutely correct, as representing the actual result of a change in quality—such as a changing over to incandescent lighting, and so tending to a decreased consumption; while on the other hand the increased use of gas for heating and cooking will have had the tendency to increase the average individual consumption. However, I think the statement is sufficiently valuable as proving the contention.

It will be of further interest to quote the experience of the late Mr. Foulis, as to the effect of a reduction in candle power. The true test in this matter, he said, is the commercial one; and they had heard a great deal about the effect which a large reduction of the quality would have on the consumption of gas. He remembered when they reduced the illuminating power in Glasgow, not by 2 candles, but by 5 candles, they were told by many eminent engineers that they would have to enlarge all their pipes, that the consumption would go up so enormously that they would require larger works, and that the gas consumers would be charged something like 20 per cent. more on their accounts. They reduced the quality by 5 candles; but they did not enlarge their pipes, and the consumers' accounts did not go up.

Regarding the calorific value of coal gases of different illuminating power, no definite relationship can be held to exist between them. Samples of coal gas of the same illuminating value, but produced from different coals, are found to differ in their chemical composition. Calorific value is entirely dependent on composition; and it has been found that gases of the same candle power, but produced from different coals, and therefore differing in the percentage composition of their constituent gases, show difference in calorific value. Professor Lewes instances an example, as indicating that it is not possible to take calorific value as bearing a correct relationship to illuminating power. He has shown that a 16-candle gas may be anything between 575 and 650 B.T.U. gross, and will vary between such limits according to the kind of coal used, and as to whether it is a pure coal gas or a mixture with carburetted water gas.

I have already stated that difference in composition is reflected in the calorific value. It is interesting to consider the case of hydrogen, of which ordinary gas contains 40 to 50 per cent. When considered by weight, a pound of hydrogen, when burnt, yields more heat than any other substance. Accordingly, it might be too readily assumed that hydrogen was the most valuable heating gas at our disposal. It is the lightest of our elements, however; and knowing that a cubic foot weighs only 0·00536 lb., by calculation it requires 186·5 cubic feet to weigh 1 lb. The heating value per cubic foot is 325 B.T.U. gross; while from the fact that water is the only product of combustion, the net value is only 272 B.T.U.—a comparatively low figure.

The following statement shows the calorific value of the important constituents of coal gas:—

Gas.	B.T.U. per Cubic Foot.	
	Gross.	Net.
Hydrogen	325	272
Methane	1024	919
Carbon monoxide	330	330
Ethylene	1603	1510
Benzol vapour	3718	3574

Taking the above values and the percentage composition of an average sample of coal gas, we have the following results:—

Hydrogen	47·80 per cent.	×	272	= 13,001
Methane	38·60 ,,	×	919	= 35,473
Carbon monoxide	4·30 ,,	×	330	= 1,419
Ethylene	3·20 ,,	×	1510	= 4,832
Benzene	2·30 ,,	×	3574	= 8,220
				62,945

The calorific value is therefore 629·45 B.T.U.

The above is interesting as showing the relative heating value of the principal constituent gases. It conclusively proves, as emphasized by Professor Lewes, that methane is the factor which makes coal gas so important as a gaseous fuel. When we come to consider the part played by light-yielding constituents of coal gas—such as ethylene and benzene—and their effect on the calorific value, we find that, while an increase in luminosity takes place, the heating value of the gas does not increase in the same ratio. This points to what has already been said as to the influence of methane on calorific value. The following table shows the relative light and calorific values of the various hydrocarbons:—

Gas.	B.T.U. net.	Illum. Value per 5 Cubic Feet.	B.T.U. per Candle.
Methane	919	5 2	883·0
Ethylene	1510	70·0	107·1
Benzene	3574	820·0	21·8

From the above, it can be readily deduced that a coal gas enriched with benzol vapour, while increased in illuminating value, is not increased in heating value to the same extent. We are, therefore, able to understand that a pure coal gas produced from a good splint coal may have a higher heating value, if it should be rich in methane, than the same gas enriched 2 or 3 candles with benzol.

High candle power and high calorific value do not mean increased efficiency in the use of mantles. What is required is really not calorific value, but flame temperature; and the temperature of the flame is not governed by the calorific value of the gas. The calorific value of a gas is the amount of heat yielded by its complete combustion. The temperature of the flame, however, will depend on the time a given volume of gas is consumed together with the area in which combustion takes place. It is the intensity of the flame which is the factor at work; and the amount of light emitted by a mantle is not entirely dependent on calorific value. Professor Lewes, in working with water gas, and using a Welsbach mantle, obtained a value of 19·38 candles per cubic foot. The gas employed had a calorific value of 325·7 B.T.U., and gave the same light per cubic foot of gas consumed as would be given under ordinary conditions with a "C" Welsbach burner using a coal gas of 630 B.T.U. The ordinary mantle would require 4 cubic feet of gas of 630 B.T.U. in order to yield the best results; while in the case of the water gas, just double the quantity was consumed—the light also being double.

I should just like to say that much experimental investigation has yet to be undertaken in order to more thoroughly understand the complete relationship existing between calorific and illuminating value, having regard to the different coals and under varying conditions of carbonization; and this the more especially as regards the higher quality produced from cannel coal. What is much desired is information on the following lines:—

1.—The illuminating power and calorific value of coals carbonized at different temperatures.

2.—The above factors with regard to different coals from different centres of production, giving gases varying in composition.

3.—Also similar evidence as to the practical effects of the various enriching agents (oil, benzol, &c.) on calorific value and flame temperature as affecting results obtainable with mantles.

A few investigators have already put forward results; but I am not satisfied that these can be held as conclusive. I hope to permit myself the opportunity of following out this line of investigation, should time allow, taking the coals of the several grades from the various districts. Some coals give good illuminating power and poor heat value; and we wish to know which are the coals to be best relied upon for one as well as the other. The problem of what quality of gas the future will require is essentially one of investigation; and doubtless when the proper information is before us, we will be better enabled to pilot our way.

I do not desire to enter at any great length into the financial aspect—the lessened cost to the manufacturer, and the monetary gain to the consumer. Doubtless this is of first importance; but there is sufficient subject matter in this direction for another contribution. Broadly speaking, if we produce our gas from the cheapest and most readily available coal, and leave aside the duty of enrichment, we will be doing our best to sell gas at a low figure. A gas-works may be making gas of 20-candle power cheaper than a works selling 18-candle gas, simply because the former is using the cheapest and most readily available coal. Cost is, after all, the first consideration of the consumer; and undoubtedly the necessity of the moment is a low selling price. The cheaper a commodity is—and examples are world wide if we look at some of the most simple articles of daily use—the more it will be prized and made use of by the consumer. The towns that are selling the largest amount of gas in relation to the population are those in which the price of gas is low. Take the case of Alloa, where gas has been sold at a low figure for some time—thanks entirely to the splendid efforts of my predecessor in office, Mr. Yuill—you will find that, with a total district population of 13,000, the gas sold amounts to nearly 90 million cubic feet. There are towns with double the population and selling a considerably less amount of gas.

Taking a rapid survey of matters during the past decade, who will deny that the demand of the public has been for more light? A higher lighting efficiency has been required by private individuals and public authorities; and finality in this respect has not yet been reached. How, and by what manner of means, have we been enabled to successfully meet the full requirements of the individual consumer and at the same time beat back the

strong current of opposition? Has it been by increasing the quality of the gas in order that the consumer, who delights in viewing naked flames, might have more light for the same money. Is not the economy of flat-flame burning altogether dependent on keeping up the illuminating power? No such policy has been dreamt of; and the consumer's interests have not suffered, neither have the interests of the gas manufacturer, or we should not be able to so proudly point to the extraordinary increase in gas consumption, together with a lowering in price of gas, an experience common to every gas undertaking throughout the country. To what does the gas industry owe the splendid position it occupies as regards street lighting considered on its merits of efficiency and economy! Not, certainly, owing to an increased illuminating power of gas, but rather, to put it tersely, due to a policy of extinguishing the flat-flame, and getting increased lighting value by means of the mantle.

The mantle has proved the salvation of the gas industry; and when it can be shown to the satisfaction of the consumers that it is the cheapest and the best medium wherewith to obtain the absolute value of coal gas as a lighting agent, and thus enable ourselves to manufacture the cheapest and most suitable gas for the purpose, and produced from the coal from the most economical and most readily available source, we will not be proving antagonistic to the mutual interests of all concerned in taking a further step forward. We must move with the times, if it be but slowly. Our perspective, however, must not be too much glorified in attempting to reach the ideal at one rapid stride. Hence it must be readily admitted, in contemplation of new movements, that we should mix prudence with our judgment, and while the time may yet not be fully ripe, we should bear in mind that we are the leaders in action, and by educating and awakening the consumers, they must inevitably follow in the direction in which, it may be, we ourselves will be forced, and so planting our industry on a firm and sound commercial basis. It is unwise to speak of reducing the quality of our gas and essay the attempt by bringing about too great a ratio of reduction all at once. Such policy must result in initial failure. The policy to be observed in lowering the quality of gas can only be successfully carried out, if I am correct in my conception, during a period of educational development.

Discussion.

The PRESIDENT having opened the discussion,

Mr. J. BALLANTYNE (Hamilton) said the subject of the paper was one which, as Mr. Napier had said, required a very great deal of investigation; and it was also one which, he was sorry to say, very few had either the means or the appliances necessary for investigating in the successful way that was required. Mr. Napier had gone into the thing, so far as he (Mr. Ballantyne) could see, in a very exhaustive manner indeed, and had brought a large amount of matter before them which was well worthy of their consideration. He (the speaker) had often maintained at these meetings—and he still held the opinion—that they should only supply gas from the coal in their locality which was available and suitable, without enrichment of any kind. He had neither faith nor belief in bolstering up the gas with benzol or cannel. They should give the people gas from the coal which was most suitable to them, and at a fair price; and he thought that in this way they would have far better financial results than by trying to keep up the quality of gas, which so many did. Of course, very much would depend upon local conditions, and also on the pipes in houses. If they had a house with only a $\frac{5}{8}$-inch pipe, they could not furnish a supply of gas anything like adequate, with either flat-flame or incandescent burners. Pipes were put in, perhaps thirty or forty years ago, and until they had them taken out, and larger ones substituted, there would be this difficulty; but if they produced a lower quality of gas, and supplied it in such a way that it gave satisfaction to the consumers generally, those houses which were ill-adapted to the quality of gas must be fitted with better piping. Mr. Napier seemed to have very much increased his day consumption. He noticed that it had gone up, from 1897 to 1903, no less than about fifteen times; while his night consumption had augmented barely 40 per cent. This showed in what direction they ought to make provision for the future. The thing now was day consumption—the supply of gas for cookers, heaters, and motive power. In this way, there was no doubt that they had a wide field open to them in which to contend with the electric light. Electricity had come to stay with them; and they must enter into competition with it, and make the best of matters. It was a strange thing that even although they supplied consumers with the best class of burners free, they found that they would not come for them. They would not accept a good substantial burner for nothing, but would rather pay 6d. or 1s. for an importation. He came across one the other day which was burning 10 cubic feet per hour; and the woman had paid 6d. for it. These were among the difficulties they had to contend with. More than a year ago, he tried very hard to get the local plumbers to enter into an arrangement for the supply of incandescent burners; but he found it impossible to get them to move. Yet, if the Corporation were to go into the business, they were the men who would turn round and say they were taking away their bread and butter. It was the same with gas-cookers. Now they were turning round and abusing them for taking away their living; and in this way, when these men had the opportunity, and refused to take it, he thought that they, as gas managers, should have but little hesitation in going in for any new scheme which was likely to benefit the people and the gas undertaking. He had very much faith in the high-pressure form of incandescent gas for public lighting, which was coming in. He thought it would take a very much higher place in the near future than the ordinary incandescent burners; but the benefit to be derived from the amount of gas consumed would not be great to the private consumer, as compared with the ordinary incandescent burners. As he had said, however, it was most difficult to get their consumers to take any initiative in introducing anything new. He was sorry to say they had nothing like the number of incandescent consumers in Hamilton that Mr. Napier seemed to have. They were increasing, but at a very slow rate. The people seemed to prefer the flat-flame burners; and until they could in some way get them convinced that they would be cheaper and better with incandescent lighting, they must put up with the things, and make the best of them. The flat-flame burner had been in existence so long that he was afraid it would be difficult to get many people to go in for incandescent burners.

Mr. J. CARMICHAEL (Barrhead) was sure they had listened with great pleasure to the paper read by Mr. Napier; and he would say that it was one which was very much against the high illuminating power gentlemen who were present. It appeared to him, as it must have appeared to many of them, that in future the value of gas must be determined by its heating efficiency, more than by its illuminating power. When they considered that gas-engines were displacing steam-engines, and took into account the quantity of gas which was used for motive power and for cooking and heating, and, further, that it was a fuel gas which was required for incandescent lighting, he could not see why they should keep up the illuminating power. Professor Vivian B. Lewes said, in one of his papers, that if they reduced gas from 20 to 12 candles, which was 80 per cent., it did not mean 40 per cent. off the heating power, but only 25 per cent. Therefore, they had a gain in reducing the illuminating power. Mond gas, though sold very cheap, was not suitable for incandescent lighting; but if they were desirous to hold the field, they must endeavour to make a gas of from 12 to 16 candle power, which would do for incandescent lighting, and all that was required. This ought to be the aim of every gas manager. Consider for a moment if they had the flat-flame burner abolished, what a happy time they would all of them have.

The PRESIDENT said they had a gentleman with them that day who had travelled a long, long road to come, he did not say specially for their meeting, but he had travelled the road nevertheless. He referred to Mr. Thompson, of the Metropolitan Gas Company of Melbourne. He would ask Mr. Thompson to say a few words on this question.

Mr. R. O. THOMPSON said it was certainly true that he had travelled a long way to see the gas-works in this country; but he came as a student, to learn. He had been very much impressed with the paper which had been read in reference to the illuminating power and calorific value of gas. When he was a young man, he was connected with a works which made gas of very high quality—half-and-half Boghead and ordinary coal—but now and for the last few years, he had been accustomed to make gas from ordinary coal alone. He fully agreed with the author of the paper that the time had come when they must reduce the quality of their gas. In England, when Sir George Livesey and others spoke of the reduction of the quality, they had little conception of the high power of the gas which was supplied in Scotland. It was all very well to speak of the reduction of the gas from 16 to 14 candles, because there was no difference in the size of the pipes required. As Mr. Ballantyne had said—and it was his own experience—when they had a very high quality of gas, they could do with smaller pipes in the streets, and also in the dwellings. But it would be absurd to think that they could any of them reduce the quality in Scotland to the English standard of 14 candles, and that the pipes which were in use there would not require increasing. There was scarcely any doubt in his mind as to this. In England, he did not know that they would have so much difficulty as they would have here. In England, they were troubled a good deal with naphthalene; and if they reduced the quality of the gas to 14 candles, the tendency to form naphthalene, either at the works or in the streets, was very much increased. His own experience, with a high-quality gas, was that he did not know what naphthalene was. But, coming down, to get the greatest benefit they could out of common coal, naphthalene arose; and he found now, in England and elsewhere, since they had Siemens regenerator settings and high heats, naphthalene had very much increased from what it was. They had always had naphthalene with them; but with the high-quality gas in Scotland, he thought they were not troubled with it as they were in England. The author of the paper had taken very great pains in bringing the matter before them. It was a studious and splendid contribution. But it was a question whether, in Scotland, they should come down to so low a point, because with the lower value they would get naphthalene. He understood that Mr. Bray intended to introduce a series of burners to enhance the power; but the real thing, and what they wanted, was the incandescent burner in lighting. In looking round the towns in Scotland, he was somewhat surprised to see that they had so many flat-flame burners in the streets. One of the speakers had said that the people would not take incandescent burners on sale. Then it was their duty, as gasmen, to show that it was the best for their

consumers, either lending or giving them, or letting them have them at a cheap rate. They had always found that electricity was not the best form for outdoor lighting; and in Glasgow, with its smoky atmosphere, electric lighting could not vie with the incandescent gas-burner. The moral effect of the incandescent burner was very great indeed; and it was very fit that they should induce consumers to have them in their houses. But, as he had said before, he was greatly surprised to see so few incandescent burners in their houses. He had visited many places where they were building houses, and he found that they were not putting in gas-fittings at all, but electric light fittings; and the people were getting educated to the idea that the electric light was the light of the future. He thanked them very much for the paper, and for the opportunity given him of making these few remarks.

Mr. A. Yuill (Dundee) said there were occasions in one's experience when one would rather sit and listen; but that day his feelings were somewhat mixed. While he courted the former, he had a duty to perform before the Association, more especially upon this paper, which had been read so ably by his successor at Alloa. It had been his misfortune not to hear the major part of the paper; but from what he had heard, he thought it was one of those which they could well take home with them and study at their leisure. So far as he had been able tol earn about Mr. Napier's paper, it was a question as between the illuminating power and the calorific value of gas—the relationship of the one to the other. They all knew that if they were using coal of a kindred class, the ratio of the calorific value to the illuminating power was somewhat constant; but when they came to deal with (say) carburetted water gas, and compared it with coal gas, they knew there was a difference, because the constituents of the two were entirely different. In the former they were dealing with carbonic oxide, which had a lower heating value, and, consequently, the heating power of the carburetted water gas was somewhat reduced. Then they might have to deal with a gas enriched by benzol. This, also, gave them different constituents, if they took an analysis of the various gases. So far as he could see, Mr. Napier's object was not a question of advising them as to the introduction of the incandescent burner. They were all assured on this point—that the incandescent burner had come to stay. Anyone who had seen the lighting which had now been adopted in large cities would at once come to the conclusion that arc electric lighting had had its innings, and the present day now saw the innings of the incandescent gas-lamp—more especially in the streets. He did not think he could say more. They would pardon him, because he could not criticize Mr. Napier's paper, not having heard it. But he wished to thank him; and he would say that he felt honoured in thinking that he was going to maintain the position that Alloa had taken up in the past.

Mr. A. Waddell (Dunfermline) said that, in rising, he would not do anything in the way of criticizing the paper at all. It appeared to him to have been received with a great deal of unanimity as to its importance. Those on the other side—the high-illuminating power men—must surely be having a second thought over the matter, because they were not much in evidence that day. One thing he would like to say, and it was this, that the high qualities of gas they made from cannel coal, to enrich it up to the old standard of 27 or 28 candles, was largely dependent upon benzol for these qualities. He had always had a difficulty in understanding why some of those who advocated enrichment objected so very much to benzol for the purpose. As to enrichment in any form, he never was a great advocate of it. He had always been of the opinion that if they made a gas from something like a splint coal, they would be doing the best for the consumer; but the public themselves had had something to do with the subject of the quality. And provided they were asked to make a better quality of gas than they could get from splint coal, then it was a question of what was the best; or, at any rate, there was no denying that if they were required to make light—and it was light that was cried for—the cheaper they could get that light the better. But this was not very much a criticism of the paper, because it appeared to him to be very much the opinion of the meeting that a low-quality gas was the kind to be supplied. In regard to heating value, undoubtedly, in referring to this, Mr. Napier had now touched a question that was very ripe for consideration; and he had pointed out the difficulties of finding exactly what coal would give the best illuminating power and the best heating value too. He had shown the difficulty they had in ascertaining this; but, after all, he did not know that very much better could be done than what had been said—use the coal they could get in their own locality, to make what might now be called a low-quality gas. Of course, it was a matter upon which there was not much to be said, except what Mr. Thompson had said about naphthalene. He thought that while in the past they had been very free from naphthalene in Scotland, and only a few of them had been troubled with it; yet he was afraid they had got rid of it in a very expensive way. It was simply washed out by those enriching vapours for which they paid very dearly; and it would be much better, he thought, if they could simply avoid the coal which gave trouble with naphthalene. He might say he had had some difficulty in this direction. He was getting a particular coal, and he suspected it as the cause. He then did without this coal, and he had no further trouble from naphthalene. The subject Mr. Napier had brought before the meeting was one which was as much present in their minds as it could possibly be; and it had been handled in a way that was exceedingly creditable to him.

Mr. W. Ewing (Greenock) said that, like the author of the paper, he had at all times had a tendency to advocate low-quality gas. In supplying such gas, they had the advantage of being able to get a regular quality of coal, and they had never the trouble caused by trying to enrich by a candle or more. No doubt when they used the lower quality of coal they were liable to the trouble spoken of by Mr. Thompson—naphthalene. He had been in works where this trouble was so great that they had to keep a staff of men clearing the lamp-posts day and night. Sometimes a branch or a service 2 inches in diameter would become solidly choked up within two or three days. Naphthalene was a difficulty that was not easily overcome. In some places they used a little benzol as a solvent. But they would always have naphthalene to a greater or less extent where they had high heats. The present tendency was to take as much as possible out of a ton of coal. Enrichment was an easy matter; the volume paid. He thought the time had now arrived when 15-candle gas—a thing he had advocated for many years—should be used generally in Scotland. If they came down to 15-candle gas, and employed incandescent burners, the difficulty in regard to fittings would be nothing. The smaller pipes, in view of requiring only about one-third of the volume, would suit the requirements. While he was Manager of the Hamilton Gas-Works, he startled his Committee, and perhaps some of the older members of the profession, when he proposed, about ten years ago, that incandescent gas-burners should be supplied free, because cookers and gas-fires should be free. The tendency of the times was now to do this; and it could be done with advantage, and at a great profit, to any concern, where the thing was properly handled.

Mr. W. Currie (Alexandria) said he should like to ask Mr. Napier how far he thought they might go in the direction he had indicated, before they came to actual producer gas. There was no doubt of this, that where a considerable quantity of gas was required for motive power, they seemed to be able to get it much cheaper from natural producer gas; so that, if they had important concerns going in individually for this form of gas supply, of course it would somewhat curtail the field of action of gas companies. This matter was brought home to him personally by the fact that there was a very large firm in their district who had given them considerable trouble in insisting upon getting a high-power gas, but who had now gone the other way, and had erected a 4000-horse power plant for the purpose of using producer gas. Primarily, this was intended for an electric power plant; but he supposed this was only a step towards lighting up their works with electricity. What he would like to know was whether it was at all possible that producer gas might be made by gas companies, and distributed in the same way, and also give light to those who required it, in addition to those who needed it for motive power purposes. There was no doubt that it was very much cheaper than anything they could approach to in their present methods of working. Mr. Napier had given them a great many valuable figures, and had also provided a most important contribution to the subject.

Mr. T. Lighbody (Renfrew) said they anticipated, from the paper, that it was a first edition, as Mr. Napier mentioned three several points which required particular attention. He really thought it was too much to expect any individual member of the Association to go into this matter, in the manner in which it should be gone into; and, as they had a Research Fund which was practically lying dormant, and none of them could expect, except men in the larger works, who had plant lying handy, to do this kind of work, it might be worth the consideration of the Committee whether the Research Fund should not be used in having this matter probed to the bottom. He might say there was only one part of the paper which had disappointed him; and in regard to it, Mr. Napier had covered himself by remarking that there was room for investigation. He expected they could not get information with regard to the calorific value of the gas at Alloa without enrichment, and also after enrichment. This was a point which, he supposed, would follow at some future date. He threw out the suggestion that the Research Fund should be used to get the matter probed. He was in the happy position, he believed, of supplying the largest gas-engine in Scotland; and while much had been said as to reducing the illuminating power, it was calorific value, and not illuminating power, that was the essential. In their place, 75 per cent. of the gas was used for its calorific value, and 25 per cent. for illuminating power; and he thought it was ridiculous to supply anything above 16 candles.

Mr. A. M'Leod (Dawsholm) said he had had very great experience in the matter of calorific value. For a period of two years, they tested the gas at Dawsholm with the Junkers calorimeter; and they found that, with a difference of illuminating power of 2 candles, there was no difference in the calorific value of the gas. Taking their present gas, of (say) 20 candles, they found that they had about 670 B.T.U. Sometimes the gas would go up to about 22 candles, and they would, perhaps, get only about 640 units. So that he thought in making experiments with the Junkers calorimeter they would require to make an analysis of the gas as well. With a 21-candle gas, they only obtained 650 B.T.U., and with a 20-candle gas they got 670 B.T.U.; so that it was a matter of the analysis of the gas. It depended entirely upon the methane, Mr. Napier said; so that, to get the best results, they would require to have an analysis of the gas. They were being troubled with naphthalene at Dawsholm. They used no cannel there now, but splint coal. In the Temple works, they had oil

gas for enrichment purposes. He made several experiments with oil-gas tar—a tar of the paraffin, and not of the benzol series—and he found that the oil-gas tar was able to absorb more than its own weight of naphthalene, so he introduced the coal gas at the top of the oil-gas scrubber; and by this means he was able to wash it down to the tank, and thus get clear of the naphthalene. They found it in the tank below in cold weather. The foreman came to him one day, and said there was ice in the ground tank. It was naphthalene, half-an-inch thick, which had run through from the scrubber.

Mr. NAPIER, in closing the discussion, said he had to thank them for the manner in which they had received his paper. Mr. Lighbody mentioned the Research Fund. He did not know to what extent it was a dead-letter; but in one of the London Chemical Societies it was quite a common thing to give a particular chemist a contribution for the purpose of making investigations and researches in specialized subjects. If he might throw out a hint to the Committee of the Association, they might possibly see their way to give a small contribution for the purpose of carrying out the experiments spoken of. If so, he should be very glad to have the contribution, and to put himself to the trouble—and it would be no small trouble, he could assure them—to carry out the experiments. He had been conscious, from the beginning of the consideration of his paper, of the want of matter to go upon. A great deal of work required to be done. As he pointed out in his paper, they needed to know the calorific and the illuminating power of the gas; and they also found that managers had to control commercial concerns, and they required to know the coals which would give the best value, for heating as well as for illuminating purposes. They wanted to know the value of the different coals produced in the various districts. Mr. Ballantyne mentioned that he was very much in favour of high-pressure incandescent gas for street lighting. He (Mr. Napier) had some little experience of street lighting at Alloa, and he had no hesitation in saying that the day of the electric arc lamp was drawing to a close. He was inclined to think that the ordinary incandescent burner was best suited for street lighting, in so far as they had a greater number of units, and at the same time a much better distribution of light. It was not high centres of light that were wanted. If some of them had doubts as to the value of benzol enrichment, he would just like to assure them that he had none whatever upon the point. In the winter months, at Alloa, the temperature was very low, not at the works, but at the consumers' meters—say 50° Fahr.; but he had himself observed that there was no depreciation of illuminating power. Mr. Currie raised the question of the position of gas companies with regard to producer gas. Obviously this was a matter of commercial standing. One had to manufacture gas at a certain price in order to meet competition. Calorific value was the basis upon which to decide. Producer gas of 130 B.T.U., and coal gas of perhaps 150 B.T.U., ought to be sold, broadly speaking, at about the same price; and he considered they would not be able to compete with producer gas until they were in a position to sell coal gas at 1s. 6d. per 1000 cubic feet. The question had been raised by Mr. Currie that gas companies might see the necessity for supplying producer gas. This, in his (Mr. Napier's) opinion, was not what was wanted, because they would increase their plant, or capital expenditure, and at the same time would increase their mains. What was wanted was the lowering of the quality of the gas, and, what was of still greater importance, the educating of the consumer. This was absolute and necessary. His feeling on the whole matter was that gas companies and corporations had not given to their customers that amount of attention which the importance of their industry deserved. If they took commercial men, dealing with any particular undertaking, they would find that they spent a considerable amount of money and gave a good deal of attention to directing the affairs of the concern.

The PRESIDENT said they had listened to a most interesting contribution to the proceedings. It was not so much what Mr. Napier had told them, as what he had suggested for their consideration, they had to think of. Mr. Napier had stopped short at a point which they would have liked him to cross over; but he was going to tell them something more in the near future. They hoped he would not delay that time too long. The question before them was one they had been talking about for an extensive period—that of high and low quality gas. It was strange how districts differed in nomenclature as to gas. They heard Englishmen speaking of high-quality gas; but they discovered that what they meant by high-quality gas was gas of 16 or 17 candles. When they came to Scotland, they discovered that high-quality gas ran up to 28 or even 30 candles. It seemed to him that there was a great deal in what some of the speakers said, that it was the coal most convenient to the district which should be used. There was coal in Germany which, he supposed, only gave about 10 candles; but this suited the Germans very well. They just adapted themselves to this particular coal. But what about districts which had no coal of their own, such as his? If it cost 1s. 6d. per 1000 cubic feet to put 20-candle gas into the holders, and he wished to supply 15-candle gas, the consumer thereby was, he would not say defrauded, but he lost 25 per cent. of his lighting—that was, provided he used flat-flame burners. Some of the speakers had pointed out that the relation was constant between the calorific value and the illuminating power. If it were, then the consumer also lost 25 per cent. of his heating value. Professor Lewes said that if they reduced gas 40 per cent. in lighting, it only reduced it 25 per cent. in heating value. But supposing they only reduced it 25 per cent., they must, in fairness, reduce the price by, at least, 25 per cent. He put it to them, Was it possible for him, or for a great many managers, who could make gas and put it into the holders at 1s. 6d. per 1000 cubic feet—because it was only there that they could effect a saving—to save 25 per cent. on their manufacturing charges? Unless they could do this, then they could not sell their gas at 25 per cent. less. If they reduced the price from 3s. to 2s. 3d., that was 25 per cent. reduction. They could not possibly take 9d. per 1000 cubic feet off their manufacturing charges. So they had to be very cautious how they reduced the illuminating power, in order to give the consumers due justice. Keeping the consumers' interests in mind, they ought to be very careful. They should not rush the question at all, but take time and consider it well; otherwise the consumer was bound to suffer. He did not say this in disparagement of the gentlemen who were advocating the subject; but let them take the whole matter into consideration before they took any step.

The third paper read was by Mr. J. Napier Myers, of Saltcoats—entitled "Unaccounted-for Gas." It will be given next week, together with a report of the interesting discussion upon it.

ELECTION OF OFFICE-BEARERS.

The PRESIDENT announced that, as the result of the ballot, the following had been elected office-bearers for the year:—

President.—Mr. J. Carmichael, of Barrhead.
Vice-Presidents.—Mr. W. B. M'Lusky, of Perth, and Mr. L. Hislop, of Uddingston.
Members of Committee.—Messrs. W. Ewing, of Greenock, J. Napier Myers, of Saltcoats, W. M'Crae, of Falkirk, and A. Wilson, of Glasgow.
Secretary and Treasurer.—Mr. R. S. Carlow, of Perth.
Auditor.—Mr. R. B. Main, of Glasgow.

NEXT PLACE OF MEETING.

It was agreed to hold the meeting next year in St. Andrews.

THE VOTING FOR OFFICE-BEARERS.

Mr. LIGHBODY asked the number of voting papers that had been returned.

The PRESIDENT said he understood it was 43.

Mr. LIGHBODY said he would give notice of motion for an alteration in the method of taking the vote. When only 20 per cent. of the members returned their ballot-papers, there was something wrong. He moved that the Committee consider whether any other and better method could be devised for taking the ballot than that at present in use.

Mr. J. N. MYERS seconded the motion.

The PRESIDENT said he thought the motion was quite reasonable. He did not see that any objection could be taken to considering the subject; and if any other, and probably better, means could be found for securing a larger return of the ballot-papers, it was certainly advisable to try it. Only 43 returns out of their membership was not at all satisfactory.

Mr. T. WILSON (Coatbridge) did not think they could have adopted a better plan than they had done.

The PRESIDENT remarked that there could be no harm in considering the subject.

Mr. FAIRWEATHER said that the matter had already been discussed in the Committee, but there had never been any other means devised or suggested, so far as he knew. He sympathized very much with Mr. Lighbody's suggestion, and was quite of his opinion that it was desirable some other means should be adopted of getting the members to vote. He had much pleasure in supporting the motion.

Mr. A. WADDELL (Dunfermline) did not think the question was whether the members were at fault in not voting, but how to get them to vote.

The PRESIDENT ruled that the motion was adopted. The Committee would consider the subject, and if any better means of voting could be devised, they would recommend it to the members.

Mr. CARMICHAEL thanked the members for the honour they had conferred upon him in electing him as President for the ensuing year. He was also very pleased that St. Andrews had been selected as the place of their next meeting, and hoped they would have a good gathering there.

CONCLUDING BUSINESS.

Mr. LIGHBODY, as the Past-President, presented the President with the medal of the Association, with the usual compliments.

The PRESIDENT returned thanks, and expressed the pleasure he had had in presiding over the affairs of the Association during the year.

Mr. M'LUSKY proposed a vote of thanks to the Secretary and Treasurer.

Mr. CARLOW acknowledged the compliment, and the meeting was brought to a close.

DINNER AND EXCURSION.

In the evening a large party of members and friends, including ladies, dined together in the Grand Hotel. On Friday, the annual excursion was held, the party sailing to Inverary.

THE GAS CONGRESS AT ST. LOUIS.

In the "JOURNAL" for the 12th ult., we gave a short account of the proceedings at the St. Louis Gas Congress. We are now able to supplement it by additional particulars taken from the latest numbers to hand of our American contemporaries.

As already mentioned, in the absence of the Chairman of the Congress Committee (Mr. C. J. Russell Humphreys), the congress was opened by Mr. Rollin Norris, of Philadelphia, the President of the American Gaslight Association, who briefly explained that the gathering was the outcome of a resolution submitted to the Association in October last, as recorded in our columns at the time. The originator of the congress was Mr. F. H. Shelton, the President of the Western Gas Association; and in his favour Mr. Norris vacated the chair while he delivered his opening address. It was devoted to a consideration of some of the unsolved problems of the gas profession, and to an indication of the lines along which it was possible that further progress might lead its members. While much had, he said, been done in the past in the way of improving and cheapening their product, the future was rich in possibilities of further increase. It was these that gave to the profession its absorbing interest; and to some of them Mr. Norris proceeded to direct his hearers' attention.

Dealing first with the possibility of reducing the cost of gas by the use of cheaper raw materials, Mr. Norris remarked that while it was possible that in the near future there might be some reduction in the cost of anthracite, and probably more in that of coke-oven coke, no permanent and material reduction could be looked for in regard either to them or to gas coke. Pea coal, or other small-sized anthracite fuel, offered a possible generator fuel at a lower cost per pound of carbon than the ordinary sizes; and it was quite possible that, by the use of a larger generator and specially designed grates, this cheaper material could be used to advantage, and the interest on the slightly greater cost of apparatus would not be important. The use of coke breeze or other fine fuel in the form of briquettes was also a possibility in some places; and this Mr. Norris thought promised some economy. He pointed out that there are considerable sections of the country where soft coal is locally produced at a price materially less than that of anthracite or coke; and the use of this coal in generators was a field which seemed to him not to have yet been fully worked. The Loomis, Rew, and Rose-Hastings processes had, he said, all handled this material with a certain degree of success; and though they had been almost, if not entirely, displaced by apparatus using hard generator fuel, he could not believe that the last word on this subject had been spoken. The most important item in the cost of water gas was the price of oil; and he feared they could not look for material reduction in this direction. The possibilities in the way of cheaper raw material, therefore, were not particularly promising or important for either coal or water gas.

Passing on to review the operations attending the production of the last-named gas, Mr. Norris remarked that the generators now use from 30 to 32 lbs. of water per 1000 cubic feet of gas made, and of this steam only 50 per cent. is actually converted into gas. In other words, if all of the steam admitted to the generators were decomposed, it would result in a reduction of about 15 lbs. of steam per 1000 cubic feet of gas made, or (roughly) a saving of from 2 lbs. to 2½ lbs. of boiler fuel per 1000 cubic feet. He considers that with the present apparatus we have reached about the limit of efficiency, and cannot expect much increase by any modification of heats carried. Additional efficiency may result from the application of some such principle as that employed in the Peebles process, by which an endeavour is made to break up a small proportion of the oil into permanent high-candle power hydrocarbons, and then, by condensing out the condensable vapours and treating them again; the final result being that a larger proportion of the oil is converted into these desirable hydrocarbons than is the case when, as in ordinary practice, endeavour is made to complete the gasification of the oil in one treatment. Mr. Norris expressed the opinion that a synthetic production of permanent hydrocarbon gases of greater or less illuminating value offers some promise; but here we get into the domain of elaborate chemical research where prophecy is especially dangerous.

On the subject of the size and shape of retorts, and whether they should be horizontal or inclined, Mr. Norris said there was no promise of marked improvement upon the best results already achieved. It would therefore appear that, if we are to look for any important advance in this branch of the business, it will be along some such radical lines as the use of "very small retorts and short charges, the retorts probably being charged and discharged mechanically." Mr. Norris thinks the Settle-Padfield process may or may not lead to important developments in coal-gas practice; but it is along some such fundamentally changed lines as these that we must look for any large improvement in coal-gas manufacture.

Increased knowledge of what happens to the gas during the process of condensation may lead to improved methods which will allow of a gas of higher candle power being produced from our present coals, as it is one of the peculiarities of the process of condensation that the vapours coming down in the liquid form convey in solution a certain proportion of hydrocarbons which are normally gaseous, and would remain in the gas if they were not thus carried down by the condensing tars. The author went on to say that a more promising field for possible economy lies in the reduction in the wastes of the process as represented in the potential heats of the escaping blast products, and the sensible heat of the finished gas leaving the superheater. He went somewhat fully into the possibilities of effecting economy on these lines in a paper on "The Theoretical Effect of Pre-Heating Blast, Steam, and Oil in the Manufacture of Water Gas," read before the American Gaslight Association in 1891; and to this, as well as to one by Mr. A. G. Glasgow, entitled "The Practical Efficiency of an Illuminating Water-Gas Setting," read in the previous year, he referred at some length.*

The use of machinery in larger works, and the simplifying of such machinery so as to cheapen it and put it within the reach of the smaller works, offers, to Mr. Norris's mind, some hope of reduction in labour costs to compensate for the general tendency towards increased wages and shorter hours; but, except in coal gas, the margin for saving in labour per 1000 cubic feet is not very great in well-conducted works. Purification has reached a point where, with the proper apparatus, the total cost for material and labour is very small; and the principal cost at present is the interest on the amount spent on the plant. Mr. Norris thinks it is quite possible that we may see some considerable advance in the way of increasing the returns from residuals. The principal residual in water-gas manufacture is, of course, tar; and he believes that there is a fertile field for investigation in its utilization by separating it into its various distillates, and working up uses for this special material. This, however, is a subject which demands an amount of skilled research not usually available except for the largest works; but the author considers it is a subject which would seem to commend itself as a suitable one for association work, if ever the point is reached where the gas industry as a whole would see the advantage of contributing to the support of work of this sort for the general good of the profession.

Up to this point, Mr. Norris had spoken only of ordinary water-gas and coal-gas processes; but he went on to refer to others which, in the course of events, may have an important bearing on the gas business. He remarked that straight oil gas appears to be useless except for very small installations where the selling price per unit is high; but a very low-priced supply of oil might well alter these conditions. Straight water gas, enriched with benzol or its equivalent, does not seem to be adapted to American conditions. Producer gas is so low in heating value as to be unpromising in its possibilities. Acetylene is used for lighting in between 100 and 150 small towns and settlements in the United States; but the average number of meters supplied is only 30 to 40, and the price runs from $10 to $15 per 1000 cubic feet. So, in spite of the number of places where it is used, it may be said to have no direct bearing on the gas industry as a whole. Coke-oven gas is essentially a process for making coke, with gas as a bye-product. Under certain conditions it has considerable local importance as a source of partial supply of gas; but, in the nature of things, the process cannot be generally utilized. Mr. Norris thinks that "if we could get a sufficiently cheap supply of oxygen which would be free from the presence of nitrogen, the entire gas business would be revolutionized, as we should be able to manufacture a sort of producer gas which would be practically free from non-combustible, and would carry in the form of gas almost the entire heating value of the fuel from which it was made." He pointed out that an unlimited supply of oxygen, not combined with other elements, is available in the air; and he said there would seem to be "no reason why the advance of science should not eventually give us some way of straining out the nitrogen, so as to leave us the oxygen for our purposes."

The author next emphasized the point that better utilization of gas is equivalent to a reduction in price; and he showed that the prospects for improved appliances are good. The incandescent burner, with its high lighting efficiency, is being constantly cheapened, and we should be able to expect still further improvements in this system of lighting. Gas-stoves for cooking are coming into almost universal use in summer; and no radical change in their design seems probable. The efficiency of gas heating appliances, when properly designed, is already very high, and is only limited by the necessity for getting rid of the products of combustion, when the consumption is large. The cost of gas made by the present processes is, however, so high that there seems no prospect of any large proportion of heating work being done under existing conditions. The discovery of a sufficiently cheap method of isolating oxygen, however, as already remarked, would, in Mr. Norris's opinion, practically wipe out of existence the present system of heating houses by isolated coal-stoves, as it would allow of the delivery in a gaseous form of nearly all the heat of the coal.

Leaving the technical side of the problem, and the possibility of reducing the portion of the cost of gas represented by material and labour, Mr. Norris proceeded to show that there is another phase of equal importance. The actual cost of gas as delivered to the burner is represented not only by the cost of material and labour entering into its manufacture and distribution, but to this must be added the interest on the investment in the plant required for its production and distribution. Speaking roughly, interest at 6 per cent. is about equal to the entire cost of the gas into the

*Mr. Glasgow's paper was noticed in the "JOURNAL" for Dec. 30, 1890 (p. 1338); and Mr. Norris's in the number for Dec. 29, 1891 (p. 1180).

holder; and at 10 per cent. it would be almost double. In other words, a reduction of 10 per cent. in the cost of plant per 1000 cubic feet of gas sold would reduce the actual burner cost of the gas an amount equal to from 10 to nearly 20 per cent. of the holder cost. The interest charge on the investment can be reduced by lessening the cost of the plant by cheaper apparatus for its manufacture and distribution, by low-cost apparatus which will enable the gas to be made at the time of demand (thus reducing the amount of necessary investment in holders), or by any improvement in methods which tends to produce high yields and rapid make from existing apparatus. The interest charge will also be reduced by any development which tends toward a more uniform output per hour and per day—thus increasing the quantity of gas that a given plant can sell per annum; and larger sales per square mile of territory will also reduce this item of interest charge by reducing the cost of the distribution plant per unit of gas sold.

Mr. Norris closed his address as follows: It is not claimed that the problems to which I have alluded are the only ones that confront our business; but they serve to show roughly the field before us, and perhaps to indicate some of the lines along which progress is possible. To the younger men among us a realization of the amount that we do not know should be a spur to redoubled effort to surmount these difficulties; and we should be strengthened by that high conception of duty that recognizes the obligation resting upon every man to do what he can to advance the general cause of knowledge and truth. Reduced cost of gas means more than simply increased earnings. In the long run it inevitably means cheaper gas for the public, and consequently a more general extension of the comfort resulting from its use. The inspiration of the engineer comes not only, and not chiefly, from the financial returns that his efforts bring to himself and to the company, but to the realization of the joy that comes from helping to do the world's work with a smaller expenditure of energy in the form of labour and material. To add to the comfort and happiness of mankind by bringing conveniences within the reach of a widening circle, is an end in itself worthy of our manliest effort, and in itself a reward worth all the cost of our life-work. Toward this progress Gas Associations and their work should be most effective factors; and every man should feel it his duty and his privilege to bring to these Associations a record of such of his work as will aid his neighbour and add to the general fund of human knowledge.

At the close of the address, which was well received, it was resolved to refer it to a Committee, and the reading of the papers was commenced. These proceedings will be noticed later.

Dealing in "Chemische Industrie" with the prospects of the calcium carbide industry, Herr Wangemann says the consumption of carbide in Germany during the current year will, it is estimated, be about 20,700 tons, while the production will be 13,300 tons; leaving 7400 tons, or about 35·7 per cent. of the total, to be imported. In dealing with the prospects of the carbide industry, attention is drawn to the new fields opened out by the introduction of dissolved acetylene and of calcium cyanamide prepared from calcium carbide and atmospheric nitrogen.

At a recent inquiry at Hastings, on behalf of the Local Government Board, by Mr. H. P. Boulnois, in regard, among other things, to an application by the Corporation to borrow £3416 for new plant at the electric light works, a representative of the Ratepayers' Association (Mr. H. B. Carter) laid some significant figures before him. He pointed out that in the past four years there had been a total deficit of £5467, made up as follows: In 1900, £1741; in 1901, £1949; in 1902, £1080; in 1903, £950. He explained that the loss might be attributed to two facts—that too much was originally paid for the undertaking, and that a large proportion of the current had been sold at too low a rate. He followed this up by saying that were it not for the high price charged for the public lamps—£40 each per annum, compared with £22 to £25 only in some other towns—the deficit would appear at a much higher figure. He quoted the late Borough Electrical Engineer to the effect that the present plant ought to be sufficient to earn a further £4000 per annum; and he urged that the application was consequently unnecessary. He suggested that if the Board saw fit to sanction the proposed loan, or any portion of it, the facts he had adduced should be borne in mind, and that the sum asked for should be granted only on condition that the price charged to consumers should be increased in order that there should be no direct annual loss. The suggestion was quite needed, for £1000 has already been charged on the district rate, and a similar sum placed upon the estimates for the present year. At the last meeting of the Town Council, a report of the Electricity Committee was adopted recommending a new system of charging for current by what is called the "summer and winter" system, under which the consumer will pay at the rate of 6d. per unit for the maximum number consumed by an entire installation during one hour's burning per day in each of the two summer quarters, and during three hours' burning per day in each of the two winter quarters, *plus* a charge of 2½d. per unit for all current consumed in any quarter above the maximum number of units. This system will take the place of the present charge of 10s. per lamp per annum spread equally over the four quarters; and it seems that the Corporation will benefit to some extent by its adoption. They certainly require some help to get rid of their deficit.

THE HYGIENIC SIGNIFICANCE OF SULPHUR IN COAL GAS.

At the Congress of the Sanitary Institute held at Glasgow last week, one of the papers submitted was on the above-named subject; the author being Dr. Samuel Rideal, F.I.C., whose evidence before the Departmental Committee on Gas Testing in London has recently been noticed in our colums. The following is an abstract of the paper.

The author began by stating that last year he found that the atmosphere of London was frequently more vitiated with sulphur than the air of rooms in which gas was burning; and this led him to make a further study of the subject. A large number of experiments with the South Metropolitan Company's gas, purified by lime only and by lime and oxide of iron, were carried out, and the results were reported to the Committee already mentioned. Speaking generally, they showed that: (1) The average sulphur in the air is higher than in either of the two used rooms, when either gas is burned in an ordinary way. (2) The sulphurous acid is also higher in the outside air than in the rooms. (3) There is more sulphurous acid proportionately in the outside air than in the air contaminated by either gas. (4) That the gas purified by oxide only gives a slight increase of the sulphurous acid and sulphur in the rooms over the lime-purified gas, but does not reach the quantity in the outside air. (5) The total sulphur in the outside air varied from a minimum of 0·0082 to a maximum of 0·0235. Country air contains about one-fifteenth of this amount of sulphur.

The total sulphur and sulphurous acid content of the air in closed rooms where known volumes of the two gases had been burnt, was determined simultaneously with that of the outside air, and in no instance had the theoretical increase of sulphur been obtained from the air of the rooms. Taking the ordinary gas as containing 10 grains of sulphur per 100 cubic feet, a burner passing 5 cubic feet per hour would theoretically increase the total sulphur in a closed room of 1000 cubic feet capacity by 0·05 grain per 100 cubic feet of air per hour, less the amount lost by ventilation. On the contrary, the quantities of total sulphur and sulphur dioxide obtained under these conditions are usually considerably less than that of the outer air. The maximum increase obtained was 0·01 grain of sulphur per 100 cubic feet on the 7th of December, after 54 feet of the "red" gas had been burnt in the closed room during ten hours, which is about 100th part of the sulphur evolved in the room. This loss of sulphur was proved not to be due to the ventilation of the rooms or to carbonic acid determination; and, moreover, the sulphur content of the air of the room with gas burning was in most cases diminished.

Dr. Rideal went on to point out that the important factor is the absorbent action of the ceiling and walls of the room; the sulphur acids being at once fixed by the lime. Dry air passing into closed rooms through walls, &c., loses a measurable part of its sulphur compounds. This filtration would be increased by the presence of aqueous vapour. The fixation of the sulphur by the ceiling was proved by the analysis of the plaster. Similar analyses were made in February from the ceilings of two rooms in Westminster, which were whitewashed at the end of the previous December. Room "A" was lit by electric light, and practically no gas was burnt there. Room "B" (a larger one) had had approximately 10,000 cubic feet of gas burnt in it since whitewashing. The quantities of sulphur were found to be as follows: Room "A," 0·168 per cent.; room "B," 0·504 per cent. The weight of material used on the ceiling of the latter room was estimated at 45 lbs.; so that the whole ceiling of 427 square feet had absorbed 743 grains of sulphur during the eight weeks, which was probably more than half of that given off by the gas burnt. The gas supplied in this case was the Gaslight and Coke Company's, containing about 12·5 grains per 100 cubic feet, or a total of 1200 grains.

These experiments show that: (1) The air in a room in which no gas has been burning for some time contains less sulphur than the outside air; that is to say, that the incoming air, by ventilation through the walls, is purified from sulphur. (2) That the theoretical quantity of sulphur produced by burning gas in a room cannot be recovered from the air of a room, but is removed from the air very rapidly, especially in the upper portions of the room, by the basic condition that obtains there, and by the condensation of the water produced on the cold surfaces. (3) By condensing the aqueous vapour in gas-lighted rooms, it is possible to show that practically a quantitative removal of the sulphur from the air takes place by the condensation of the water. As the chief product in the combustion of coal gas is aqueous vapour, it follows that all the water above that required to saturate the air will condense on cold surfaces; and in a room of (say) 1000 cubic feet capacity, the combustion of 50 cubic feet of gas might easily cause 2 lbs. of water to condense after the air had been saturated at 60° Fahr. This water contains most of the sulphur, and does not separate usually in the form of fog, but on cold surfaces. Only a minute fraction will normally settle on metals, while the greater portion is fixed on the cold basic walls and ceiling.

To ascertain the maximum corrosive effect on iron, the author compared the quantity of water, sulphur acids, and iron in the condensed water of a Carron condensing stove in London and

Glasgow, under similar conditions, with an argand burner regulated to 8 cubic feet per hour, and with a run of four hours. Only a very small part of the sulphur was obtained by the stoves, so that the corrosive effect was less than that which one theoretically would have expected from the sulphur content of the gas. The quantity of iron oxidized was in most cases directly proportioned to the sulphur, and approximated to 56 parts of iron to every 32 parts of sulphur; showing that it was attacked in atomic proportions, and was at first oxidized to the ferrous condition. There was thus practically no difference in the effect of London and Glasgow gas, although the sulphur content of the former has been restricted to less than about 20 grains for the past half-century.

Dr. Rideal next gave particulars of some experiments on the influence of gases on blood pressure now in progress in conjunction with Dr. Oliver, of Harrogate. So far as they have gone, they show that carbonic acid raises the blood pressure when 10 volumes per 100,000 volumes are present in the air. When the carbonic acid is produced by burning coal gas, a similar rise in blood pressure is noticed, notwithstanding the fact that sulphurous and sulphuric acids both have an opposite effect. They are present in such small quantities, therefore, as to have no real physiological action. Numerous experiments point to the conclusion that carbonic acid in the air raises the blood pressure, and that it falls quickly again in pure air. Small quantities of sulphurous acid act conversely, and lower the blood pressure. In air vitiated by the products of combustion of coal gas, the effect of the carbonic acid outbalances that due to the sulphurous acid present.

The germicidal action of the sulphur compounds, on the other hand, is appreciable on cold surfaces. The condensed water from a sterilized ice-flask suspended in a passage of a house in Victoria Street, Westminster, with the windows open and no gas burning, showed an average of 33 organisms per cubic centimetre. In a small room, with approximately 2 cubic feet of gas burning per hour, the condensed water contained 4 organisms per cubic centimetre; and 0·01 c.c. from the window (which had not been previously cleaned) was found to be sterile. A sterile ice-flask was suspended in a small room, the gas lighted, and the condensed water collected. After four hours the gas was turned off, and the receiver under the ice-flask changed without entering the room. With the gas alight there were 18 organisms, and with it turned off 2 organisms, per cubic centimetre, which would correspond to approximately 3 organisms per cubic foot in the first case, and 0·4 in the second.

In order that the deposition of the bacteria should be brought to a constant, the small room was prepared overnight, so that the gas could be turned on and off, and known areas of nutrient gelatine exposed, without entering the room, which was closed at 7 p.m. on the 19th of January. On the 20th, a plate was exposed from 9 a.m. to 1 p.m., when no gas was being used. The number of organisms per cubic foot of air was found to be 10. From 1 p.m. to 5 p.m., a second plate was exposed with gas burning; and the number of organisms was 6·4 per cubic foot of air. From 5 p.m. to 8 p.m., with no gas burning, a third plate showed 5·9 organisms per cubic foot of air. In order to ascertain whether the small quantity of sulphurous acid present in the condensing water from an atmosphere where gas is burning could be expected to have any germicidal effect, the following experiment was carried out: Three standard solutions of sulphurous acid in distilled water, containing 2 parts SO_2 in 1000, 10,000, and 100,000 parts, were infected with an equal volume of a highly diluted pure culture of *B coli communis*; a control being prepared at the same time with distilled water. After four hours' contact, the number of organisms was determined in 0·5 c.c. of each, and found to be: Control, 942 organisms; 1 part SO_2 per 1000, 0; do. per 10,000, 20; do. per 100,000, 636. So that in four hours the bacteria had been killed by the sulphurous acid as follows: 1 part SO_2 per 1000, 100 per cent.; do, per 10,000, 98 per cent.; do. per 100,000, 32 per cent. A similar bacteriological test was then made with *B coli communis* and the actual condensed water from a small room where gas had been burning at the rate of about 5 cubic feet per hour. A titration of the condensed water showed 9·8 parts of sulphurous acid per 100,000, and no organisms could be obtained from 2 c.c. After an hour's contact, it was found that 32½ per cent. of the bacteria had been killed.

Dr. Rideal concluded by stating that since these experiments had been concluded, the Departmental Committee already referred to had recommended the abolition of the sulphur clauses so far as the Metropolis is concerned; and he thought there could be no doubt that similar relief would be afforded to the few Provincial companies and towns which are now working under restrictions in this respect.

The Final Award in the Omagh Arbitration.—The final award of the Arbitrator (Mr. J. W. Edmundson, of Dublin) in connection with the purchase of the Omagh Gas-Works by the District Council has been received. He fixes the sum as in the original award—viz., £26,880—and includes the works and undertaking of the Company, except movable stock-in-trade, gas coal, or other stores; and also except the book and other debts, and the books and papers relating exclusively to the members and the constitution of the Company.

CARBURETTED WATER GAS COMPARED WITH COAL GAS FOR INCANDESCENT LIGHTING.

There has been issued, as a supplement to the report of the Photometric Committee of the German Association of Gas and Water Engineers, a valuable paper giving the results of tests made by Dr. Schmidt and Dr. Leybold, at the Hamburg Gas-Works, on the effect of additions of carburetted water gas to coal gas on the light developed in the incandescent burner. The following is a digest of the paper.

It has been generally recognized that, with coal gas, increase in the calorific power is attended by increased illumination from the incandescent burner. It therefore seemed important to determine also what effect admixtures, in various proportions, of water gas, carburetted with brown coal tar (lignite) oil, with the coal gas, would have upon the light developed in that burner. The carburetted water gas used was made in a Humphreys and Glasgow plant. It was to be expected that the conditions would be somewhat different from those obtaining with neat coal gas, owing to the higher specific gravity of carburetted water gas as compared with that of coal gas (·65 against about ·40), which would have the effect of altering the rate of consumption at uniform pressure from the same burner nipple according as more or less water gas was added to the coal gas. Further, the nature of the disillumined water-gas flame is different from that of the coal-gas flame—its size being smaller and its temperature higher.

The experiments were carried out with an ordinary Welsbach burner with clear chimney. The four air-holes in the mixing-tube were 0·275 inch in diameter, and could be reduced in size by turning an overlying brass ring having holes of the same size. The five holes of the gas-nipple were enlarged until the burner consumed 3·71 cubic feet of coal gas per hour at 1 inch pressure. The coal gas and mixed gas used in the experiments were stored in an experimental holder, having a capacity of about 7060 cubic feet, and were taken through an experimental meter to the Welsbach burner. The illuminating power afforded by the burner was determined for each of the following rates of consumption—viz., 3·71, 3·88, 4·06, 4·24, and 4·41 cubic feet per hour, while the air supply was regulated by means of the outer ring in every case until the maximum light had been attained.

The calorific values of the coal gas and carburetted water gas were as follows:—

—	Calorific Power. B.T.U. per Cubic Foot at 60° Fahr. and 30 In. Bar.		Specific Gravity at 59° Fahr.
Coal gas	630 gross.	559 net.	·393
Carburetted water gas	523 ,,	481 ,,	·670

Tabular Statement of Results.

[(*a*) Pressure of gas in inches. (*b*) Candle power in English candles. (*c*) Candles per cubic foot, calculated direct from the "litres per Hefner" of the original tables.]

Rate of Consumption. Cubic Feet per Hour.	Series A. (*a*)	(*b*)	(*c*)	Series B. (*a*)	(*b*)	(*c*)
Coal gas—						
3·71.	1·0	70	*19·0*	1·0	69	*18·7*
3·88.	1·1	69	17·7	1·2	73	18·7
4·06.	1·2	65	15·9	1·3	72	17·7
4·24.	1·3	65	15·3	1·4	66	15·5
5 per cent. water gas—						
3·71.	—	—	—	1·1	68	18·3
3·88.	—	—	—	1·2	75	*19·4*
4·06.	—	—	—	1·3	72	17·7
4·24.	—	—	—	1·4	74	17·6
10 per cent. water gas—						
3·71.	1·0	65	17·5	1·2	75	20·2
3·88.	1·1	72	*18·5*	1·3	78	20·0
4·06.	1·2	73	18·0	1·4	82	*20·4*
4·24.	1·3	72	17·0	1·5	85	20 0
20 per cent. water gas—						
3·71.	1·0	65	16·7	1·3	75	20·2
3·88.	1·1	70	18·0	1·4	80	20·5
4·06.	1·2	75	*18·4*	1·5	86	*21·2*
4·24.	1·3	77	18·3	1·6	86	20·4
4·41.	—	—	—	1·7	86	19·4
40 per cent. water gas—						
3·71.	1·1	67	18·0	1·5	53	14·4
3·88.	1·2	74	19·0	1·6	82	21·2
4·06.	1·3	78	19·3	1·7	86	21·2
4·24.	1·5	82	*19·4*	1·8	90	*21·4*
4·41.	—	—	—	2·0	90	20 5
60 per cent. water gas—						
3·71.	1·2	65	17·0	—	—	—
3·88.	1·3	75	19·1	—	—	—
4·06.	1·5	79	19·4	—	—	—
4·24	1·6	88	*20·7*	—	—	—
4·41.	1·7	89	20·0	—	—	—
100 per cent. water gas—						
3·71.	1·4	66	17·7	1·7	72	19·4
3·88.	1.5	74	19·1	1·8	78	20·0
4·06.	1·6	80	19·6	2·0	88	21·6
4·24.	1·7	86	20·4	2·2	92	*21·8*
4·41.	1·8	91	*20·7*	2·2	92	20·9

The results obtained in the testings are shown in the preceding table (Series A). The results of the testing which showed the highest illuminating duty for each gaseous mixture are given in italics. The results show clearly that the rate of consumption of the gas should be increased as the proportion of water gas in the mixture rises, in order to obtain the highest duty, while, further, the light afforded rises, the greater the amount of water gas added. The increase in the pressure of the gas, from (for example) 1 inch with coal gas to 1·6 inches with 60 per cent. of water gas, cannot *per se* have exerted any appreciable influence on the illuminating power, as it is well known that a considerable rise in the light only begins to occur at much higher pressures. It is interesting to observe that the calorific power of the carburetted water gas was lower than that of the coal gas.

A second series of tests was made with another burner-jet; the inflow of air being regulated as before until the maximum light was obtained. The gases used in these tests had the following qualities:—

—	Calorific Power. B.T.U. per Cubic Foot at 60° Fahr. and 30 In. Bar.		Specific Gravity at 59° Fahr.
Coal gas	594 gross.	528 net.	·374
Carburetted water gas	547 ,,	502 ,,	·603

The results obtained in these testings are also given in the table (Series B). They likewise show that the rate of consumption should be raised as the proportion of water gas is increased, in order to secure the highest duty, and that at ordinary pressures the light obtainable from the incandescent gas-burner can be augmented by adding water gas to the coal gas, provided the air supply to the burner is regulated accordingly.

A COAL-SCREENING PLANT.

In his recent evidence before the Royal Commission on Coal Supplies, Colonel Sadler stated an incontrovertible fact, when he laid it down that coals may very often be greatly improved by the simple process of "picking." The coal, to be submitted to this operation, as is very well known, is carried on a travelling belt, which should be of ample length, and well lit from the roof. Operatives standing on each side of the belt, at short distances, pick out the stone, shale, and other foreign substances as the coal passes along. The contract for a complete screening plant—including picking-belts, with jigging-screens, revolving-tippler, and various conveyors, together with the necessary steel structural work and gearing—has recently been concluded between the Mirfield Colliery Company, of Ravensthorpe, and Messrs. Graham, Morton, and Co.; and a brief description may be of interest.

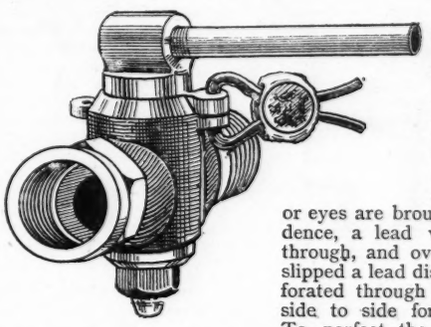
Commencing with the revolving tippler, this is of the latest type, with a diameter of 6 ft. 6 in. It is arranged to convey the whole of the coal from the tubs to the screens without waste, and to reduce the breakage to a minimum. The rims are of cast-iron, firmly stayed by 1 inch diameter tie-bolts. The rails inside the tippler are formed of 3½ inch angles, and are provided with a steel plate shoot, for delivering the coal on to the jigging-screen. Driven from the jigging-screen by cast-iron sprocket wheels is the distributing roller, itself of cast iron, and mounted on a 2 inch diameter shaft. The jigging-screen is fitted with plate meshes, so arranged in themselves as to vary the size of the mesh as desired. The jigger sorts into three classes of coal—smudge, nuts, and best. The length of the jigging-screen is 18 ft. 6 in., and the width 5 feet. The primary screen has a screening surface of 65½ square feet, and is composed of 1½ inch diameter holes, set closely together. The secondary screen has a screening surface of 45½ square feet, composed of ½ inch diameter holes, likewise set closely together. The fittings for driving the screen consist of two 5 inch travel eccentrics, mounted on a 3 inch diameter shaft, provided with pedestals and loose collars. On the under side of the jigging-screen are two steel-plate shoots, for delivering the nuts and slack to the picking-belts.

There are three belts, arranged to convey the coal to the trucks, with lowering shoots at the end. The nut belt has a hopper arranged for taking coals from the belt to cart or corve. Two hoppers are supplied to the "best" belt, and the coal, hand-picked or unpicked, can be taken by carts. The whole of the hoppers are supplied with traps and levers, and are easily opened and shut as required. No 1 picking-belt is 4 feet wide, with 58 feet centres; No. 2, 3 feet wide, 50 feet centres; and No. 3, 3 feet wide, 40 feet centres.

Each of the conveyors consists of a lattice-braced framework, built up of angle-iron stanchions, and completely cross-braced by means of flat bars. The standard driving and trailing end fittings consist of 24 inch diameter cast-iron hexagonal drums, and mounted on 3½ inch diameter steel shafts. Each conveyor is supplied with two strands of 12 inch pitch cast-steel chain; and to each pair of links—one on either strand—are firmly bolted the ¼ inch pressed steel plates—the trays and chains being supported by means of 6 inches diameter cast-iron rollers, mounted on 1½ inch diameter steel shafts. At the end of each conveyor are three steel-plate shoots, for delivering the material into the waggons. And here a word as to the creeper, which conveys the coal to the revolving tippler. It is of 23 feet centres complete, and consists of end fittings, one strand of chain, and the necessary steel trough for supporting the chain. The end drums are of 24 inches diameter, mounted on 3 inch diameter steel shafts. The plant is designed to deal with an output of 500 tons per day.

A PATENT SEAL MAIN COCK.

A patent seal main cock which Messrs. Tilley Bros. have brought to notice is a simple contrivance for effecting a serviceable end; and as such we are pleased to introduce it to our readers. The name explains the object; the illustration describes how it is done even perhaps clearer than words. Still a short explanation will not be out of place. The cock is similar in all respects to an ordinary main cock, with the exception that on each side of the barrel there is cast an eye, the hole in which corresponds with a similar hole in the lug attached to the side of the plug. When the cock is shut off, the two lugs or eyes are brought into coincidence, a lead wire is passed through, and over this wire is slipped a lead disc, which is perforated through its body from side to side for the purpose. To perfect the safeguard, the disc is secured and impressed with the company's seal in the usual manner. In addition to this sealing arrangement, the cock is made in a manner to dispense with the ordinary form of loose key. On the top of the plug (as also illustrated), a screwed socket is formed—this taking the place of the ordinary square for taking the key. In this case all that is done is to screw into the socket a short length of iron rod or pipe to supply the place of the customary key, which has the unhappy knack of disappearing (unless tied in place) just when most required.



The purpose of this simple provision for sealing main cocks in this manner is to ensure that the gas-cocks shall not be opened, and a supply of gas obtained, without the knowledge of the gas company's or committee's officials to whom the cock belongs; and it will be seen that this simple expedient fully satisfies all requirements. There are several rough-and-ready methods practised (we are not referring to other well-devised and reliable means) for doing the same thing; but they do not possess the necessary quality of security. The seal is also very useful in cases of bye-passes to meters; and through it no capping of services is needed. One of the benefits of the method described of replacing the key is that, in a sense, it standardizes main cock keys. In the old way, the makers varied the sizes of cocks and keys; and this has been a source of trouble in the distribution departments of most gas undertakings. Besides which there is no chance of the key being lost, as in effect it is simply a fixed lever which need never—in fact, cannot, without being deliberately unscrewed—leave the cock. Simple, useful, expeditious, labour-saving, and secure, sum up the benefits of the additions which have been made to this main cock of Messrs. Tilley Bros.

RESISTANCE DUE TO BENDS IN PIPES.

By John C. Trautwine.

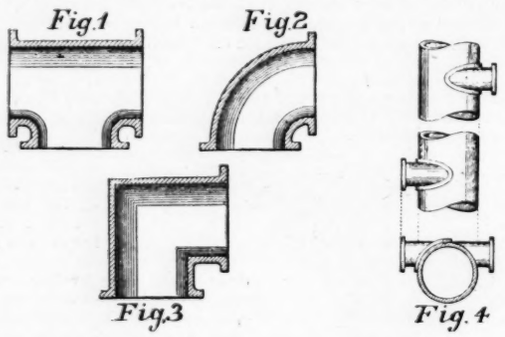
[A Paper read before the American Water-Works Association.]

In a recent case, where a pair of water-works pumps were installed under the writer's auspices, the contractor for the pumps, upon his first visit to the station after their installation, expressed surprise at finding that connections like fig. 1 (p. 334) had been used on both the pumping and suction mains. He claimed that the employment of such connections was not sanctioned by good engineering practice, and that they offered a much greater resistance to the flow of the water than would connections of the form shown in fig. 2. As the writer would have been sorry to have sanctioned a construction which greatly increased the burdens upon the pumps, he has taken some pains to ascertain to what extent the criticism is borne out in fact; investigating not only the additional resistance probably due to the form of connection used, but also the usage in such matters.

The shapes of the connections, as shown in figs. 1 and 2, were obtained from the founder who furnished the castings. They are well-known, standard types. As to the additional resistance due to the use of the form in fig. 1, instead of that shown in fig. 2, the writer knows of no experimental data and of no formulæ applying to this exact case, where fig. 1 has the same rounding, on the inner side of the bend, as fig. 2 has. The nearest are the formulæ of Weisbach for the resistance in the form in fig. 2, and

for that in a sharp bend (fig. 3), without any rounding off of the corners. These formulæ are as follows: For such right-angle bends as fig. 3, $h = 0{\cdot}98\, y^2 \div 2g$; for right-angle curves, as fig. 2, $h = [0{\cdot}131 + 1{\cdot}847\, (r^7 \div R^2)]\, y^2 \div 2g^2$, in which h is the head in feet required to overcome the resistance due to the bend or curve, r the inside radius of the pipe, R the radius of the axis of the curve, both in the same unit, y the mean velocity of flow in the pipe (in feet per second), and g the acceleration of gravity = 32·2 feet per second.

According to these formulæ, for a discharge of (say) 3 million gallons per day (the maximum delivery of each of the two pumps in question), the resistances are as follows, in pounds per square inch, for figs. 3 and 2 respectively: 14-inch suction main, 0·125 and 0·042, additional for fig. 3, 0·083; 10-inch force main, 0·477



and 0·150, additional for fig. 3, 0·327. In other words, if the connections had been of the sharp-cornered form (fig. 3), the resistance to the flow through one of these bends would have been greater than through an elbow like fig. 2 by less than 0·1 lb. per square inch in the 14-inch main, and 0·33 lb. per square inch in the 10-inch main.

As the average suction lift is about 16 feet (or 6·9 lbs. per square inch), and the average force-main pressure (say) 100 lbs. per square inch, a sharp-cornered bend, if it had been used, might have added nearly 1¼ per cent. to the resistance in the suction main, and nearly 0·33 per cent. to the resistance in the force main. How much less the dfference is with the rounded bends (fig. 1) actually used, the writer has no means of knowing; but it would certainly be much less than the very small figures above calculated. Indeed, it is very questionable whether the additional resistance could be detected.

As to usage, the writer found that the suction connections to the existing pump, installed some years before, are formed as fig. 1, as are those proposed by the company who supplied them in bidding on the new installation. Another bidder on the new installation submitted a design involving similar connections on the suction mains. Fig. 4 shows the arrangement of these mains for the new high-pressure fire-service pumping-station in Philadelphia, in which the branches to the several pumps are led off at right angles from the suction main, without any rounding off such as is shown in fig. 1. It appears, therefore, that the arrangement installed has the sanction of usage, and that the additional resistance due to its use is, at the worst, quite insignificant.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents]

The Economy of Carburetted Water-Gas.

Sir,—I read the leading article in your last issue with a great feeling of sorrow. The unfortunate circular issued by the Crystal Palace Board was painful enough; but the desire evinced by the writer of the article referred to, to goad on a controversy round an honoured name, over a matter which would be best forgotten, is to my mind extremely reprehensible. His system of tilting at us all will, no doubt, find plenty of "copy" for the next few weeks, if we each of us consent to be drawn. While feeling, on the one hand, it would be better to refrain from noticing the article, on the other hand I feel that it is necessary to correct the false deductions of the writer.

Amongst the statements he refers to as "facts," mention is made that as long ago as 1895 or 1896 the price of this Company's gas was 3s. per 1000 cubic feet. That certainly is a fact in itself; but the manner in which it is used is intended to imply that this was before the commencement of the manufacture of carburetted water gas by this Company, whereas it was subsequent to, and consequent on, the adoption of that system in 1894. Previous to that, the selling price of gas all round was 3s. 2d. per 1000 cubic feet. It is now 2s. 10d., with the net price for gas for power down to a fraction over 2s. 6d. This is a good 10 per cent. reduction, and something for Tottenham, if not for water gas, to be proud of.

I have no doubt this correction will bring forth a straightforward retraction of your writer's suggestion that the 2d. reduction just made by this Company is the only one resulting from the adoption of water gas.

Beyond this however, those responsible for the "Journal" surely know there are other things besides the selling price of gas in a gas company's accounts which should be taken into consideration in estimating successful or unsuccessful working. Foremost amongst these, the amount it has been possible to spend over wear and tear of works and mains must be considered; and the following table of figures taken from "Field's Analyses" (which your writer says "constitute a kind of Court of Final Appeal") show some good results since water gas has been made at Tottenham:—

Amounts Paid for Wear and Tear.

Coal Gas Only.		50 per Cent. C.W. Gas.	
1890 ..	3·54d. per 1000.	1895 ..	5·11d. per 1000.
1891 ..	4·27 ,, ,,	1896 ..	4·41 ,, ,,
1892 ..	3·33 ,, ,,	1897 ..	4·74 ,, ,,
1893 ..	4·09 ,, ,,	1898 ..	7·11 ,, ,,
1894 ..	3·72 ,, ,,	1899 ..	6·75 ,, ,,
		1900 ..	7·56 ,, ,,
		1901 ..	8·22 ,, ,,
		1902 ..	9·47 ,, ,,
		1903 ..	9·79 ,, ,,

As is well known, carburetted water gas costs far less than coal gas plant for repairs. It cannot, therefore, be argued that the increase shown in these figures is due to greater cost.

Although during the period, capital has been heavily spent for slot business, and the works have practically been rebuilt, the average capital employed per 1000 cubic feet of gas sold has been reduced from 12s. 9d., at which it stood in 1894 when water gas was adopted, to 10s. 2d. last year. This looks as though the Tottenham policy has been far more successful than your writer knew. Time was when the "Journal" looked more closely into its arguments.

I do not often trouble you with letters, and am sorry I have had occasion to do so now.

Tottenham Gas-Works, July 29, 1904. A. E. Broadberry.

[With reference to the first paragraph of Mr. Broadberry's letter, it does not appear to call for any comment; and perhaps it is better that we should not remark upon it, seeing that the issue of the Crystal Palace District Gas Company's circular has already been to him such a "painful" event, though it does not seem to have had any such striking influence among those most concerned in it. Mr. Broadberry makes an allusion to the "false deductions of the writer;" but it is on the contrary Mr. Broadberry who is making false deductions from the article. It was not intended to imply that the price of 3s. per 1000 cubic feet charged by the Tottenham Company was before the commencement of the manufacture of carburetted water gas. Previous to 1894, as we all know, prices generally ranged somewhat higher; and the Tottenham Company were not alone in subsequently effecting substantial reductions in price. The statement, therefore, that the reduction in price was "consequent on" the adoption of carburetted water gas in 1894 is an assertion without proof. There was no suggestion in the article that (quoting Mr. Broadberry) "the 2d. reduction just made by this Company is the only one resulting from the adoption of water gas." But it appeared to us that this is the only reduction that has reached the consumer since 1895. Mr. Broadberry is heartily congratulated on having been able to charge against revenue such large amounts for wear and tear, although this does not seem to affect the question in hand. The foregoing is sufficient on the points raised by Mr. Broadberry. There is, however, another matter to which we are compelled to draw attention. Throughout this letter, Mr. Broadberry refers pointedly to "the writer;" and he concludes one of his paragraphs with the rather ill-natured and discourteous observation that "the time was when the 'Journal' looked more closely into its arguments." We hope sincerely that this remark comes solely from Mr. Broadberry's unprejudiced judgment, and that he has not been actuated by any personal motive. It falls rather strangely that another correspondent, who is also intimately connected with the Tottenham Gas Company—in a communication written the same day as Mr. Broadberry's, and delivered by the same post—expresses the hope that the style of one or two of the articles in last week's "Journal" has not been deliberately adopted. This correspondent also refers to "the writer," and suggests that probably he does not fully understand the system of carburetted water gas. Once and for all, let us make this clear, that the subjects of the articles in question received the very closest inquiry before they were written; and that the suggestion that the writer does not fully understand the question of carburetted water gas is entirely erroneous. This, we hope, will be sufficient to show that the inferences of our correspondents are not correct. It is also hoped that the falling together of the two communications in the way described is purely a coincidence. The only object in these articles is, by raising doubtful points, to elicit the truth. That surely is a fair and legitimate aim for any technical journal, and does not merit the employment of discourteous terms and suggestions, such as, for example, are found in Mr. Broadberry's communication.—Ed. J. G. L.]

Mr. H. E. Jones and the Nanterre Gas-Works.

Sir,—I have an extremely satisfactory letter from Messrs. Waterhouse and Co. [see *ante*, p. 189]; but as they do not wish the whole to be published, I only quote one sentence: "We greatly regret that any statement in a letter from us should have given you cause for any annoyance, which we may assure you was far from our wish to create, and that any statement of ours should have been used so improperly, as we think, in your controversy with Mr. Graham." H. E. Jones.

Palace Chambers, S.W., July 29, 1904.

Some Reflections on Lighting Questions.

SIR,—Chaos appears to reign in the lighting world to an extent not even approached by any other branch of human knowledge, judging by the diversity of opinions expressed by the highest authorities on certain subjects. I do not refer to the very intricate question of the production of gases of different qualities, and how their intrinsic value should be estimated—though I may say, in passing, that on this subject we have such authorities as Mr. H. E. Jones and Mr. Charles Hunt opposed to such other authorities as Mr. G. C. Trewby and Mr. T. Goulden—nor do I refer to the mantle, whether woven of cotton, ramie, or collodion, as its present chemical composition of 99 per cent. of thoria for the skeleton and 1 per cent. of ceria for imparting light to it, Professor Lewes assures us there is very little hope of improving. I refer only to the burner and the mode of using it, as the medium by which the energy of the gas is converted into light.

For some years it has become a sort of dogma that the higher the pressure at which the gas is burnt, the greater the luminosity obtained of a given quantity of gas, and several companies, to say nothing of many private installations, have been formed to carry out this system; the main difference between all of them, except the "Selas" system, referring only to the manner of compressing the gas. For this system, a claim is made that ranges between 30 to 40 odd candles per cubic foot of gas consumed. But in many installations described in the "JOURNAL," I have always read, except on one occasion, on referring to the amount of light given per cubic foot of gas, the expression "it is claimed," "it is stated," "a claim is made," &c., of so many candles per cubic foot of gas.

As a contrast to all this, in the "JOURNAL" for the 10th of February last year (p. 356), you published an appendix headed "Effects of Pressure of Gas on Luminosity," giving a great number of experiments made by Mr. Holgate with a No. 4 Kern burner, commencing on Jan. 22, 1902, and finishing on the 2nd of April of the same year. There are eight sets of experiments; the lowest being four tests, and the highest thirteen. The highest pressure used was 2·10—this being in one of the tests of the first set—and the lowest 0·40, in one of the last set; the consumption of gas ranging from 6·32 to 2·12 cubic feet per hour, and the average efficiency of the gas per cubic foot being in the eight sets of tests respectively 18·02, 22·64, 28·23, 29·42, 35·155, 38·323, 52·88, and 59·5. To be more exact, with a pressure of 2·10, consuming 6·32 cubic feet of gas, a luminosity was obtained of 104·9 candles, or 16·60 candles per cubic foot; while with a pressure of 0·50, consuming only 2·43 cubic feet of gas, a luminosity was obtained of 169 candles, or 69·7 candles per cubic foot.

These long experiments, which must have involved a very serious expenditure of time and money, appear to have been made with every precaution being taken that they might be accurate, for Mr. Holgate says: "These tests were made upon a Referee's table photometer, fitted with a Hartcourt's 10-candle pentane standard; and the readings were observed by Mr. J. F. Smith, the Chemist at the Halifax Gas-Works, assisted by Messrs. W. N. Booth and Joshua Pyrah. The difficulty of comparing upon the photoped the different coloured lights was recognized; and, in order to check the figures given in this appendix, further tests have been made with two observers. These latter results confirm the former." If these experiments and tests have any value, we arrive at this extraordinary result—that with a burner which consumes about 5 cubic feet of gas, and for which a duty is claimed of 25 candles per cubic foot, by increasing the pressure to 2·10 (thus using 6·32 cubic feet of gas), the duty falls to 16·60 candles; whereas by decreasing the pressure to 0·50, consuming only 2·43 cubic feet of gas, its duty rises to no less than 69·7 candles, or more than four times as much. Is there any engineer who can tell what is the efficiency of the No. 4 Kern burner? Suppose the Welsbach Company had sent this burner to be tested, and required a certificate of the test. It would be perfectly absurd to certify that the efficiency was between 16·60 and 69·7 candles, according to circumstances; and yet I do not know what other certificate could be given.

I could give other similar cases, but this is enough about high and low pressure, and I will pass on to another subject. The recuperative lamp of Messrs. Podmore and Thomas, with ordinary pressure, has been certified to give 49 candles per cubic foot, and the makers claim a minimum of 40 candles. This high duty is obtained, we are told, by heating the gas and air before arriving at the head of the burner—the temperature of the flame being higher than it would be otherwise; and it is well known that the luminosity of the mantle increases enormously by small additions to the temperature of the flame. This appears to be rational reasoning. But as another contrast, we have the opinion of no less an authority than the late Mr. Thomas Fletcher, who, in a letter published in the "JOURNAL" for March 31 last year, in a reply to Mr. Cleverly, said: "He will also, no doubt, be surprised to learn that, owing to a very simple and well-known physical law, an increase in the temperature of either air or gas, or both, before being burnt, gives a flame lower in temperature than if colder gas and air are burnt, other things being equal." In support of his opinion, farther on he said: "It is rather curious that in a list of patents published this week is one for keeping cool the air and gas of an incandescent lighting burner up to the point of combustion; and it is evident that the patentee fully understands his subject." There is, therefore, a contradiction between the results said to have been obtained by the lamp above referred to and the opinion of Mr. Fletcher; and the question to be settled is: Should the air and gas, as well as the burner, be hot, or should it be cold? The writer was for twelve years, on and off, before he turned his attention to the present incandescent lighting eleven years ago, engaged in devising means for producing high temperatures, in order to make a platinum incandescent burner; and he does not hesitate to say, with the utmost respect for so high an authority, that, notwithstanding the physical law to which he referred, the hotter the temperature of the burner and of the gas and air, up to the point when they will combine, the higher the temperature of the flame and the greater the result. This, no doubt, is the opinion of many inventors besides that of Messrs. Podmore and Thomas.

Now comes the most complicated of all subjects I know of—that of testing the quantity of light emitted by an incandescent body. Although the number of photometers is simply legion, the International Photometric Committee are still undecided as to which they will adopt. Assuming that a photometer is perfection itself, we are assured that the ultimate judge is the eye of the photometrist; and there are high authorities for the following statements: That the testing of gas in one room, having furniture and walls of absorbing surfaces as compared with another room, may make a difference of 15 per cent. or more in the result of the tests; that the same make of mantle, one fitting the flame and the other not, may cause a difference of 25 per cent. or more; that, according to the quality of the gas used, the temperature of the flame varies so much as to make a great difference in the amount of light obtained; and that, with the same burner and mantle and the same gas, but with various pressure, the difference may be 30 per cent. in the results. Even the day of testing will seriously affect them All things being equal, a burner and mantle will give a different result if the test is made on a hot and rainy summer's day or on a frosty winter's day. No wonder Professor Lewes says it is only by long practice that the eye gets sufficiently trained to obtain an equalization of light, with the consequence that there are only a few photometrists in the country whose results in a mantle he would have confidence in.

In the appendix to which I have referred, there are several discrepancies that can be explained away, but there is one which appears most extraordinary. On the very first test, with a consumption of 3·77 cubic feet of gas, the burner gave a result of 18·70 candles per cubic foot; whereas in the 14th test, with 3·745 cubic feet of gas, it gave 28·50 candles per cubic foot. As the difference in the volume of gas used is so very small that it can hardly be measured, it is scarcely possible to understand how, on the same day, presumably with the same gas and mantle, the burner should have shown a result of 18·70 candles per cubic foot in one test and 28·50 candles in the other; and yet this is attested by the same number of witnesses.

This may be thought to be an isolated case; but it is not so. In a paper read last year by Mr. Marshall, before the Institution of Gas Engineers, about the "Selas" system, which differs from others in mixing a portion of air with the gas at a distance from the burner, instead of at the burner itself, the results of some tests are given which are very extraordinary. With varying pressure in the first three tests, an Auer burner gave an efficiency of 15, 18, and 22·3 candles per cubic foot respectively. There is, at any rate, some explanation, perhaps, for such different results; but how the same burner, after being regulated to consume, with 1 inch pressure, 3·5 cubic feet of gas exactly, should give an illumination of 47 candles in one test and 85 candles in another, which is nearly double, is beyond the writer's comprehension. If these results are obtained in tests made regardless of expense and time, not for the public who cannot judge, but to be presented to the Institution of Gas Engineers, who can judge of their work and criticize them, what value shall be attached to tests as ordinarily made, when time and expense are a consideration?

As a result of this uncertainty, each owner of a system or burner states the candle power obtained with a liberality which is only exceeded by the moderation displayed at stating the number of cubic feet of gas consumed. A burner for which the modest illuminating power of 35 candles per cubic foot is claimed was compared by the writer with a No. 4 Kern burner; and taking into account the extra amount of gas used, the result was about half of the 35 candles claimed. In America, it appears, the same thing happens, only to a worse extent. On the 11th of August last year, you published an extract from an article published in the American journal "Light," in which a description is given of a great many lamps, and the illuminating power is stated of the seven following:—

Name of Lamp.	Consumption of Gas.	Illuminating Power.
Arc	18 cubic feet	400 candles.
Lovett	17 ,,	400 ,,
Humphrey	15 ,,	425 ,,
Yotto	15 ,,	500 ,,
Lumo	14½ ,,	650 ,,
Century	17 ,,	900 ,,
Welsbach	12—15 ,,	1200 ,,

The efficiency of the first two lamps is, therefore, between 22 and 23 candles per cubic foot, and that of the last about four times as much. What a pity it is that the American Welsbach Company did not make it 12 cubic feet exactly, instead of 12 to 15 feet. In this way it would be simplicity itself, one cubic foot giving 100 candles—figures that could be remembered without fatiguing the mind.

Without going into the merits or demerits of the different systems of burning the gas for lighting—such as the low-pressure, the high-pressure, the recuperative, the "Selas," the self-intensifying, or the inverted—enough has been said to show the confusion that exists in this very important subject; and the object of this letter is to call attention thereto, and to settle, if possible, whether the advantages claimed for the high-pressure system are as great as they are represented to be. At the present time, there is in the "JOURNAL" an advertisement in which the sweeping assertion is made that, by their high-pressure system, the advertisers save 50 per cent. of the gas that would be required to produce the same light by the ordinary low-pressure incandescent lighting. This may or may not be so; but the writer has very great doubts about it. He is ready to supply a burner to be used with (say) a 2-inch pressure; and if the advertisers can prove that they can produce, by their system, the same amount of light—saving not 50 but only 25 per cent., notwithstanding the expense of installation, interest on capital, wear and tear, and attendance, to say nothing of the extra expense incurred in mantles—he is willing to hand over £10 for the information, but on condition that the test is made by Professor Lewes.

Birmingham, July 27, 1904. JAMES MALLOL.

Messrs. Biggs, Wall, and Co. have secured an order for nearly 3 miles of main pipes at Dorking, and engine and exhausting plant for Kinsale; while they have on hand several important contracts for regenerator settings and sulphate of ammonia plants. Their methane-hydrogen gas plant now being erected at Truro will be completed in a short time.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Monday, July 25.

TORQUAY TRAMWAYS BILL—THE ELECTROLYSIS QUESTION.

On the order for the third reading of the above-named Bill,

Lord CLIFFORD OF CHUDLEIGH moved to insert the following as a new clause: "If at any time it be proved that any injury or damage to any mains, pipes, or apparatus of the Corporation or of the Torquay Gas Company shall have resulted from the use of electric current on any of the tramways authorized by this Act, nothing in this Act shall relieve the Company from liability to make compensation for such injury or damage." He said this clause would require some few words of explanation on his part. The history of the matter was this: The Corporation of Torquay, being desirous of having tramways in their town, and objecting, on the score of the amenities of the place, to overhead wires, sought for some other system. Among a number submitted to them was that of the Dolter Traction Company, which appeared to meet the requirements of the case. A Bill was therefore promoted with, as their Lordships would remember, the consent of the Corporation. One of the terms on which this consent was given was the clause he now moved to insert in the Bill, the object of which was to protect from electrolytic action the water and gas pipes owned by the Corporation. The original clause, as first inserted in the Bill, had connection only with the pipes belonging to the Corporation; but when the Bill came into the other House, the Committee who considered it thought it only right and proper—and he must confess it appeared to him to embody substantial justice—that if the mains and pipes belonging to the Local Authority of the town were protected by such a clause, those belonging to the Torquay Gas Company should have similar protection. On this understanding—which, so far as he could make out, was actually agreed to by all the parties—the clause was inserted in the Bill in the other House. When it came before a Committee of their Lordships' House, the matter was again discussed; and finally his noble friend Lord Hawkesbury, who presided over the Committee, delivered a decision to the effect that the clause should be allowed under the special circumstances of the case, but that it was not to be regarded as a precedent. This, therefore, was the condition of the Bill after it had passed through the Committees of both Houses. But his noble friend Lord Balfour of Burleigh, the Lord Chairman of Committees, struck out the clause, and the measure was reported, and now came up to be read a third time without the clause which had been agreed upon by the two Committees. He (the speaker) did nof deny that he had against him weighty authority, though he was sure he would be able to show that there was a difference in the present case which removed it from the weight of that authority. In the first place, there was the Joint Committee of the two Houses which sat under the Presidency of Lord Cross, of which he was himself a member. The decision of that Committee was to this effect—that they considered the principle involved in the protective clause was against public policy in the way that it would considerably hamper invention in connection with electric tramway undertakings if the promoters of a Bill were to be subject to any other liability except that of complying with the regulations from time to time laid down and embodied in the model clause of the Board of Trade. He felt bound to point out to their Lordships how it was that in this instance—in the particular case they were now considering—the clause arranged by the Joint Committee ought not to apply. The important fact in this case was that the methods of electric traction adopted by the Dolter Company were such as had never before been tried in this country. The system was an entirely new one; and on this ground he contended that the Corporation of Torquay were fully justified in asking the Company to give them a guarantee against loss other than that required by the regulations of the Board of Trade, which were not suited to, and were not drawn up with a view to the operation of, this particular method of electric traction. It was a very natural application on their part, and—this was the point which he wished to bring particularly before their Lordships—it did not contravene the object the Joint Committee had in giving their decision, because it did not prevent the Company in question from continuing the promotion of their undertaking. The agreement entered into between the Corporation and the Company was no bar to electric enterprise, for it did not in the least interfere with the persons who were promoting the tramway in Torquay. It might be said that this clause had already been asked for in another case, and refused by Lord Morley's Committee; and this was true. But in the Beckenham case the system under which it was proposed to work the tramway was a very well-known one. It was the overhead or trolley traction system—one which had been before the Board of Trade. It was to this system that the Board of Trade regulations especially referred; and therefore all the arguments produced before the Joint Committee which had led to their recommendation had full and ample force. In the present instance, as he had pointed out, the system was an entirely new one. There was no evidence that the Board of Trade regulations dealt with it; and he submitted that the Corporation of Torquay were justified in making it a condition that this clause should be inserted. He hoped he had successfully demonstrated to their Lordships that the case was one which was quite different from those which had gone before, and that the acceptance of the clause need in no way form a precedent for the future. From all these considerations, he trusted that their Lordships would see their way to insert the clause he had moved.

Lord HAWKESBURY said, as Chairman of the Committee of their Lordships' House who had considered the Bill, he should like to make a few remarks. As his noble friend had explained, the Corporation of Torquay had insisted that there should be no overhead wires in connection with the tramways, in order to preserve the beauty of the place. An underground system was decided upon; and, as a condition to the adoption of that of the Dolter Traction Company, which was an entirely new one, the Corporation laid it down that the clause should be inserted. The Lords' Committee agreed with the opinion formed by the Committee of the Lower House. It was before the latter Committee that the addition was made for the protection of the Gas Company—words being put in giving their mains the same protection as that afforded to those of the Corporation. The Committee of their Lordships' House felt strongly that the case should stand by itself, seeing that the mode of electric traction was an entirely new departure—by means of underground channels. The system had not been considered before; and, in deciding to allow it, they accompanied it with the safeguard contained in the clause. He hoped that, under the circumstances, their Lordships would reinsert the clause in the Bill.

Lord BALFOUR said he was obliged to advise their Lordships not to accept the proposal, though he was bound to say that the noble Lord had put the case before them in a most temperate and reasonable way. He (Lord Balfour) thought he should be able to show their Lordships that to insert this clause would be destructive of all proceedings which had governed the matter for eleven years. To allow the Bill to be read a third time without the clause was the only course he could take in conformity with the almost general practice of the House in regard to this matter in past times. The whole question of electrolytic action on gas and water pipes was fully considered by the Joint Committee presided over by his noble friend Lord Cross in 1893; and the result of the deliberations of that Committee was the model clause in the Bill. The question now was whether the Tramway Company were merely to be obliged to obey the regulations made under that clause, or whether they were to give an absolute indemnity against electrolytic action to the owners of the gas and water pipes and mains. The first objection he took to the proposal was putting the Corporation of Torquay and the Torquay Gas Company in a specially favoured position. The clause which his noble friend was seeking to insert in the present Bill had been put into Bills which had been before the House of Commons. In the session of 1903, it was brought in question in their Lordships' House in the case of the Beckenham Bill. The matter was considered by a Committee presided over by Lord Stanhope as well as by Lord Morley, and, in conjunction, they advised the House to reject it. They regarded the matter as of the highest importance from the point of view of principle. There was no evidence whatever to show that the regulations of the Board of Trade for dealing with electrolytic action in these cases were insufficient, and even if they should appear to be so, it was in the power of the Board of Trade to make new regulations and take action the moment a suspicion that damage was being done was brought under their notice. He was assured by a representative of the Board that up to the present time no case of injury to pipes or mains through this action had been made out; and he had reason to believe that the noble Lord who represented the Board in their Lordships' House (Lord Wolverton) was ready to affirm this. Last year the clause was actually rejected in their Lordships' House and taken out of the Bill in which it had been put; and under these circumstances, he (Lord Balfour) should have been taking a wrong view of his duty if he had not supported the decision of the House that, whether it was an agreed clause or not, it was inadmissible on its merits and that no Committee was entitled to allow it to be put into a Bill. This was a matter for the House itself to decide. It was for their Lordships to say whether they should overrule the decision they came to last session in the Beckenham case. He was bound to tell them that the principle observed in that case had been acted upon during the past session in connection with several Bills, some of which, at any rate, had received the Royal Assent; and he therefore ventured to suggest to the House that to go back, at this period of the session, from the decision they came to last year would, by inference, inflict great hardship on persons who, believing the matter to be settled, had accepted Bills for electric traction. As he had said, the Board of Trade regarded the existing regulations as sufficient; but, if necessary, they could be altered from time to time. This brought him to one point which it was claimed differentiated this case from some others that had gone before it. The system of traction to be adopted in the case of the Torquay tramways was a new one. But there was no evidence brought forward that, in regard to electrolytic action, it was different from other systems. But it was also said that there was no evidence that it would not be different in its effect. Well, he ventured to suggest that this was not a sufficient reason for breaking up all the principles which had governed them in dealing with this matter hitherto, and for throwing the whole thing into confusion. It was all very well to talk about not setting up a precedent. To adopt the clause might not be making a precedent for those who used some other system of traction; but it would be one for those who used the Dolter system. If they put in this clause in the case of one system of traction, they would give it great advantage over all others; and he thought this would be unfair, and not a reasonable thing to do. He was entitled to assume, however, that the clause was contrary to parliamentary precedent, and those who were responsible for the Bill ought to have advised their clients that it was by no means likely that the authorities of the House would allow the clause to be inserted unless the House itself gave the order. If their Lordships wished to reverse the decision of last session, which had stood now for eleven years, they might as well abolish the model clause altogether. There was just another point. The Board of Trade might issue Provisional Orders for the making of a tramway. Well, they would not insert this clause, or anything like it, in their Orders; therefore they would have two codes working side by side, one under Bills and one under Provisional Orders. He had one more point. The model clause was general in its application. It applied to everyone who owned pipes or wires; but the clause now proposed was one protecting special interests. On this account also he hoped the House would not go back on its previous decision.

Lord WOLVERTON said, on behalf of the Board of Trade, he was anxious to identify himself with the remarks just made. There were two forms of procedure, either by Private Bill, as in this case, subject to the authority of the Chairman of Committees, or else by Provisional Order, subject to the assent of the Board of Trade. If the present proceeding had been under Provisional Order, he should have adopted the same arguments as were used so well and forcibly by the Chairman

of Committees. But he might add that he had received a letter from the Electrical Adviser to the Board of Trade (Mr. A. P. Trotter), in which he stated that he was familiar with the Dolter system, and was in a position to say that the regulations of the Board were quite applicable, and would be effective. He hoped their Lordships would support the action of the Chairman of Committees.

Viscount CROSS said, as Chairman of the Joint Committee of 1893, he went very carefully into all the arguments to be advanced on either side, and cordially concurred in the view of the Chairman of Committees. They considered that the model clause which had been referred to was the most adequate protection for gas and water companies that could be adopted. He hoped their Lordships would reject the motion.

Lord NEWTON said that, as a Chairman of Private Bill Committees, he had had, on more than one occasion, to decide the question which was now before their Lordships; and he therefore might be allowed to offer an observation in support of what had fallen from the Lord Chairman. Nothing was more common, in his experience, when a Tramway Bill was under consideration, than for the representatives of gas companies to come before them and plead that, unless they obtained protection against electrolysis, most serious consequences would ensue. But he never yet knew anyone to explain exactly what electrolysis was, or what was the exact injury which it would bring about. What had happened in connection with this Bill was obvious. The Corporation of Torquay had found themselves in the position of being able to "squeeze" the promoters of the Bill; and they had used their opportunity to the full. They had put forward this clause; and, that being so, it was sought to give the local Gas Company the same advantages. Out of generous sympathy for them, the Committee had granted them the same privilege. In his own case, he had resisted these appeals, because if they had been yielded to, they would have constituted entirely new precedents; and it was obvious at the present moment that the gas and water companies had very great protection under the Board of Trade regulations. In his opinion, it was desirable that, on questions of this kind, there should be uniformity of practice on the part of Private Bill Committees; and he therefore hoped the clause would be rejected.

Lord CLIFFORD said he wished to offer a word of explanation. The Chairman of Committees had said there was no evidence adduced in regard to this particular system of traction; but he (the speaker), in reply, wished to say it was quite natural there was no such evidence, because the system was entirely new. The Corporation thought there might be some danger to their pipes and mains through the adoption of this system, which was unknown in practice; and the promoters wished to insure them against any danger. While backing the opinion of their Lordships' House as to the danger of not following fixed plans, when it was desirable to follow them, he could only respectfully submit that this case was one which was somewhat different from others. The Dolter system was new; and, under the circumstances, the Corporation of Torquay were quite justified in endeavouring to protect themselves against a possible danger.

The amendment to insert the clause was put and negatived; and the Bill was then read the third time and passed.

A district correspondent, referring to the above debate, writes: The Torquay Corporation and the Gas Company have fared badly at the hands of the House of Lords in their attempt to convince the House of the justice of granting special protection to the Corporation and the Company against the risk of injury to their mains by the introduction of the Dolter system of electric tramway traction. It must be said that Lord Clifford of Chudleigh presented the case for special treatment in a clear and well-reasoned speech. The real point of the case as regards both the Company and the Corporation is that the proposed traction system is untried, in this country at any rate. It may be so constructed and carried out as to cause no mischief; on the other hand, it may prove very destructive to the mains. The fears of the Corporation in this direction were regarded by the Tramway Company as so reasonable that they agreed to the insertion of a special clause covering their liability to provide compensation for any proved injury or damage. Committees of both Houses of Parliament accepted the clause, and extended its provisions to the mains of the Torquay Gas Company. It was, however, struck out by Lord Balfour of Burleigh, as Acting Chairman of Committees of the House of Lords, on the ground that it is contrary to precedent, and is calculated to operate in restraint of tramway invention and development. The decision is one to be regretted, not only because of the particular injury which may result to the Torquay Gas Company and the Corporation, but because of its bearing on the question of electrolysis in general. The contention that the Board of Trade regulations are sufficient to protect the interests of the owners of gas and water mains, and that, if they are not, they can be amended, seems to miss the point that, in this and other cases, certain companies and corporations may be the victims of experiments from the success of which they can reap no profit, but whose failure in one direction may cause them great loss. The Dolter system may be all its advocates claim for it; but there does not appear to be any particular reason why the Torquay Gas Company should run any risk of loss or injury through the demonstration of its capabilities. The House of Lords rejected Lord Clifford's plea for special treatment in the exceptional circumstances, and thus overruled the decision of the Committees both of its own House and of the House of Commons, as well as the wishes of the promoters of the Bill.

The following further progress has been made with Bills:—

Bills reported: Rotherham Corporation Bill and Selby Urban District Council Bill.

Bills read the third time and passed: Barnet District Gas and Water Bill, Felixstowe Gas Bill, South Shields Gas Bill, and Swindon Corporation Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read a second time: Belfast and North-East Ireland Electricity and Power Gas Bill, Gas Orders Confirmation (No. 1) Bill, and Water Orders Confirmation Bill.

Lords Bills reported: Gas and Water Orders Confirmation Bill, Hamilton Gas Order Confirmation Bill, and Oakengates, Dawley, and District Joint Water Board Bill.

Bills read the third time and passed: Derwent Valley Water Board Bill [Lords], Gas Orders Confirmation (No. 3) Bill [Lords], Hamilton Gas Order Confirmation Bill [Lords], and Leeds Corporation Water-Works Railway Bill [Lords].

THE LEA BRIDGE GAS COMPANY AND ELECTRIC LIGHTING AT LEYTON.

The Select Committee of the House of Lords, presided over by Lord Newton, who have been considering the Bill promoted by the Leyton Urban District Council, concluded their labours last Wednesday. One of the objects of the Bill was to invest the Council with further powers in regard to their electric light undertaking. The only opposition proceeded from the Lea Bridge District Gas Company, who petitioned for the imposition on the Council of the Bermondsey clause, or the modification of it suggested this session by the Duke of Northumberland's Committee. The promoters were represented by Mr. Claude Baggallay, K.C., Mr. Gerald Fitzgerald, and Mr. Hutchinson; the Company by Mr. A. M. Paddon and Mr. F. J. Oddie. Mr. Baggallay reminded the Committee that the question of the Bermondsey clause had been fought out before the Committee of the other House, and was decided against the petitioners. He asked their Lordships to say that this was not a case which justified the insertion of such a clause. It was asked for by only one ratepayer, who was a competitor with the Council in the matter of lighting. Mr. Paddon insisted that this was a case in which the Company as well as the general body of ratepayers were entitled to the protection of either the Bermondsey or the Northumberland clause. The Council's record as electrical undertakers was one of maladministration. They had had to resort to the rates for years to bolster up the undertaking; and it was only right that, when they were seeking further powers, they should be placed under the provisions of one or other of the protective clauses named. The Chairman said the Committee were willing to give the protection asked for, but they would like it put in the mildest form. The question of free wiring also cropped up in connection with the Bill. What happened upon it is explained in the "Electric Lighting Memoranda" to-day—see p. 315.

GAS AND WATER ORDERS OF THE SESSION.

The Bills to confirm Provisional Orders relating to the supply of gas and water for which application has been made to the Board of Trade this session having now, as already recorded in our "Progress of Bills," reached the Lower House, the Board have issued the usual Memoranda setting forth the nature of the proposals therein. It is as follows.

The Gas Orders in Bill No. 1 relate to Bognor, Elham Valley, Elstree and Boreham Wood, Finedon, and Godalming. The Bognor Order is to empower the Bognor Gaslight and Coke Company, Limited, to construct further works for the manufacture and storage of gas, raise additional capital, and for other purposes. The Elham Valley Order is to authorize the construction and maintenance of works for the manufacture and supply of acetylene gas within the parishes of Elham and Lyminge, in the county of Kent. The Elstree and Boreham Wood Order is to give power to the local Gas Company to raise additional capital, and for other purposes. The Finedon Order is to give the Finedon Gas Company, Limited, authority to maintain and continue gas-works, and manufacture and supply gas in the parish of Finedon, in the county of Northampton. The Godalming Order is to empower the Godalming Gas and Coke Company to extend their limits of supply, raise additional capital, and for other purposes.

Bill No. 2 includes Provisional Orders relating to Grays, Hedon, Northampton, Rochford, and Romford. The Grays Order is to empower the Grays Gas Company, Limited, to construct further works for the manufacture and storage of gas, raise additional capital, and for other purposes. The Hedon Order is to authorize the New Hedon Gas and Coke Company, Limited, to maintain, continue, and improve their existing gas-works, construct further works, and supply gas within the parishes of Preston and Paull and the borough and parish of Hedon, in the East Riding of York. The Northampton Order is mainly to enable the Northampton Gaslight Company to raise additional capital for the purposes of their undertaking. The Rochford Order is to sanction the maintenance and continuance of existing gas-works at Rochford, in the county of Essex, the construction of further works on adjacent land, and the manufacture and supply of gas. The Romford Order is to confer upon the Romford Gas and Coke Company, Limited, power to raise additional capital, and continue and maintain additional works.

Bill No. 3 contains Provisional Orders relating to St. Margaret's, Stirling, Waltham Abbey and Cheshunt, Worsbroughdale and Worsbrough, and Worthing. The St Margaret's Order is to authorize the St. Margaret's Gas Company, Limited, to maintain and continue gas-works, construct additional works, and supply gas in the parish of Stanstead St. Margaret's and parts of the parishes of Great Amwell

and Stanstead Abbots, in the county of Hertford, as well as in the parish of Roydon, in the county of Essex. The Stirling and Worthing Orders are to empower the Stirling and Worthing Gas Companies to raise additional capital. The Waltham Abbey and Cheshunt Order is to enable the Waltham Abbey and Cheshunt Gas and Coke Company to construct and maintain additional works, to raise further capital, and for other purposes. The Worsbroughdale and Worsbrough Order is to empower the Worsbroughdale and Worsbrough Gaslight and Coke Company, Limited, to maintain, continue, and construct gas-works, and supply gas within part of the urban district of Worsbrough, and for other purposes.

The Gas and Water Orders Confirmation Bill contains Orders relating to Rainham, Sevenoaks, Southwold, Wetherby, and Meldreth and Melbourn District. The Rainham Order is to empower the Rainham Water-Works Company, Limited, to maintain and continue water-works, and supply water. The Sevenoaks Order is to authorize the Sevenoaks Water-Works Company to acquire and hold additional land. The Southwold Order is to enable the Southwold Water-Works Company, Limited, to construct additional works, extend their limits of supply, raise more capital, and for other purposes. By the Wetherby Order, the Wetherby District Water Company will be permitted to reduce their authorized share and loan capital and raise more money by means of preference shares. The Meldreth and Melbourn Order is to empower the Meldreth and Melbourn District Gas and Water Company, Limited, to construct and maintain gas and water works, and to make and supply gas and supply water within the parishes of Meldreth, Melbourn, and Shepreth, in the county of Cambridge.

The Water Orders Confirmation Bill comprises Orders relating to Bradfield, Cholderton and District, Elham Valley, Frimley and Farnborough District, and North Sunderland. The Bradfield Order is to authorize the maintenance of water-works and the supply of water in the parish of Bradfield, in the county of Berks. The Cholderton Order is to sanction the construction and maintenance of water-works and the supply of water in the parish of Cholderton, in the county of Wilts, and parts of the parishes of Bulford in the same county, and of Shipton Bellinger, Thruxton, Amport, and Quarley, all in the county of Southampton. The Elham Valley Order is to give authority for the construction of water-works and the supply of water within the parishes and places of Lyminge, Elham, Postling, Stanford, and Saltwood, all in the county of Kent. The Frimley and Farnborough Order is to empower the Frimley and Farnborough District Water Company to extend their limits of supply, raise additional capital, and for other purposes. The North Sunderland Order is to authorize the construction and maintenance of water-works and the supply of water in the parishes of Fleetham, Elford, and North Sunderland, and parts of the parishes of Ellingham, Chathill, and Swinhoe, in the county of Northumberland.

LEGAL INTELLIGENCE.

HIGH COURT OF IRELAND—CHANCERY DIVISION.

(*Before Mr. Justice* BARTON.)

Thursday, July 28.

Thompson and Son v. The Corporation of Belfast—A Nuisance from the Gas-Works.

To-day judgment was delivered in the action brought by Messrs. William and Hugh Thompson against the Belfast Corporation for an injunction and damages because of an alleged nuisance arising from the gas-works. The proceedings were reported in the "JOURNAL" for June 28 (p. 970) and July 5 (p. 47).

Justice BARTON said the case was of importance, because of the position of the parties and the character of the issues raised. It appeared, from the complaint made by the plaintiffs, that since 1900 or 1901 large quantities of smoke, smut, colley, and grime had been issuing from a retort-house erected within 70 feet of their premises; and that when the wind was easterly, large quantities of noxious vapours were blown into the interior of the premises. In the result, they alleged that a large quantity of their goods was rendered unsaleable and commercially valueless. With reference to the law applicable to cases of this kind, there were two general observations to be kept in view. The first was that in a busy manufacturing city a nuisance arising from smoke or dirt must not be judged by too dainty a standard. A resident could not complain of mere ordinary inconvenience from smoke or dirt. The matter must be judged in conformity with the plain, simple, work-a-day standard of comfort and convenience. On the other hand, even in an industrial city the line must be drawn somewhere; and if a petitioner was able to satisfy the Court that the ordinary comfort and occupation of his premises was interfered with, or his property materially injured, then he would be protected by an injunction against a continuance of such a nuisance. The other observation was that the Corporation were authorized to make and supply gas n the place upon which the alleged nuisance had been created. They were carrying on a statutory undertaking under statutory authority. The statute which empowered them to carry on this undertaking, however, contained a provision that they must not create a nuisance in making or supplying gas. Accordingly, it was not a case in which they were empowered to commit a nuisance. On the contrary, the statute under which they carried on their business preserved the remedies of the public against any nuisance that might be caused in the making or supplying of gas. The evidence of thirteen witnesses from the neighbourhood, including two doctors of good position, unmistakeably pointed to the existence of smoke and colley in large quantities. In answer, the Corporation called five witnesses from the neighbourhood and two from an adjoining factory; but in reality the defendants had never denied the nuisance until this action was brought. The examination of the minutes of the Public Health and Gas Committees of the Corporation showed that there were frequent complaints of the nuisance; that officers were appointed to investigate, who made reports against the nuisance; that Sub-Committees and conferences had endeavoured to find out some means of abating the nuisance; and that in one case £20 was paid as compensation. A remarkable feature, however, was that not a single one of the sanitary or public health officers who had investigated the matter had been called to give evidence. Then there was the evidence of Mr. Stelfox, which contained a clear admission of a number of facts which went far to corroborate the plaintiffs' case. The cause of the whole trouble and annoyance was easily traceable in these reports. It appeared that in 1891 the Corporation were in great stress for an additional retort-house. At that time, only coal gas was made. There was only one spot available in the gas-works for a site; and Mr. Stelfox admitted that even if they had known it would create a nuisance, they would have had no alternative but to erect it there. He also admitted that if they had had water gas a few years sooner, it might not have been necessary to build this house at all. It was not used, except for one season, from 1893 to 1896; and then for three years it was discontinued. It only really commenced to work in 1900; and in 1901 the nuisance began to be complained of. In 1896, it caused no annoyance, for the important reason that it was first constructed without any ventilation at all. It could not therefore cause a nuisance, because nothing escaped from it. It was unique of its kind, because, unlike most retort-houses, it was without openings at the sides, so as to avoid the complaints which it was foreseen would arise in consequence of it being so near the roadway. Instead of open side spaces along the walls, the novel plan was adopted of having a 3-feet pipe or tube along the apex of the roof, by which it was hoped the smoke would be carried off by a large chimney rising to a great height. This proved a failure, and had to be abandoned. Accordingly, in 1901 another experiment was tried, of making diamond-shaped openings in the walls some 25 feet to 28 feet from the ground, to allow the smoke and colley to escape. The effect was that, being on a level with the houses, the east wind caught the smoke and colley and carried them across the road and into the houses. This method, on being an admitted failure, was abandoned. The next plan adopted was to have eleven funnels or chimneys on the sides of the roof. These caused the same complaint; and then ventilation experts were employed. They attempted a system of powerful fans for the purpose of driving the smoke and dirt up to a height which would enable them to be carried over the houses. This also proved a failure, as the fans were not powerful enough to prevail against the east wind. Since the last failure nothing had been done; and in face of all these facts, it was very difficult for the defendants to dispute the existence of the nuisance, which was really admitted on their own reports. Mr. Cotton, of Dublin, when asked whether the house wa, constructed on proper principles, said he thought it was; but he qualified his answer by an important observation with regard to the roofs which was the very part of the construction that was complained of. Nobody had ever found fault with the machinery or other things. Sir Charles Cameron, Medical Officer of Health for Dublin, on the vital question of the position of the house, candidly gave the opinion that if the works were to be constructed *de novo* he would put it further away from the roadway. A gentleman from England, Mr. H. E. Jones, gave unqualified praise to the retort-house as it stood; but it was difficult to reconcile this evidence with the facts that had been proved, and the minutes and correspondence of the defendants themselves. None of these gentlemen had ever seen the retort-house working, or its effect on the neighbouring houses. It was strange that none of the official gentlemen of the Public Health Department who had seen the place in working order had been examined. In conclusion, he said he had carefully weighed the arguments of Counsel for the defendants, who had pointed out that no houses had been given up in the neighbourhood, and that plaintiffs and their witnesses had not left the locality. But the answer to this was that they relied on the law to protect them. Counsel also argued that dwellers in towns like Belfast must submit to a certain amount of dust and dirt, and pointed out that there were a number of factories in the neighbourhood. Making all allowance for every consideration, he could not have the slightest doubt that it had been clearly proved that an extraordinary state of things, and not by any means the ordinary state of things in Belfast or any other manufacturing town, had been caused by the erection of this retort-house, and that thereby the reasonable comfort and enjoyment of the plaintiffs and their workmen had been materially affected, and the premises rendered to a material extent less suitable for the business carried on in them. It was only right to say that throughout the whole of the matter the Corporation had shown the greatest anxiety to meet the complaints of the public. They were placed in a difficult position; but it was their duty to ventilate the house in such a way that it would not be a nuisance. The truth appeared to be that it was almost impossible to reconcile these two objects in the narrow space at their disposal. It was really, in his mind, an attempt to overcome the insuperable and accomplish the impossible. At all events, he fully recognized that they had done their utmost. Very likely Belfast had outgrown the limited capacity of this piece of ground, which was the only one available at present for gas-works. He did not, however, accept the statement that if he granted the injunction it would act detrimentally on the population of Belfast by interfering to any degree with the lighting of the city. Mr. Stelfox had admitted that, owing to the introduction of water gas, the retort-house was no longer the necessity it was in 1890. Accordingly, there was no danger that the Court, in enjoining this nuisance, would cause any real suffering or hardship to the public. He would therefore grant the injunction asked for, and the order would be in such form that the Corporation would not be prevented from making further experiments with the building if they chose to do so. He had not the slightest doubt that the nuisance had been clearly established, and that the plaintiffs were entitled to the relief they sought.

An order was accordingly made in the terms of the statement of claim, and plaintiffs were awarded their costs.

CONTRACTOR'S LIABILITY IN REGARD TO A DEFECTIVE RESERVOIR.

As briefly reported in the "JOURNAL" last week (p. 268), Mr. E. Pollock, K.C., was recently occupied for four days, as the Official Referee of the High Court of Justice, in hearing, at Teignmouth, an action in which the District Council of the town claimed £2509 from Mr. Arthur H. Slocombe, for breach of his contract for the construction of the Hazeldown reservoir in connection with their water-works. Some points arose during the proceedings which justify a more extended report than that already given.

The Council were represented by Mr. C. A. Russell, K.C., and Mr. A. Hudson, who were instructed by the Clerk (Mr. A. P. Dell). Mr. Russell explained to the Referee that the reservoir in question originally consisted of one large compartment, the dividing wall now there being one of the works carried out, in addition to relining and roofing, under the contract. The tender of Mr. Slocombe, for £5818, was accepted in January, 1890. The plans were made by Mr. Christopher Jones, who was at the time the Surveyor to the District Council. The scheme was to place bricks upon the face of the bank and over the bottom floor of the reservoir, and a concrete lining above the brickwork. The Local Government Board, through Major-General Crozier, one of their Inspectors, intimated that the plans would have to be altered by putting concrete underneath and brick above. This was an alteration which did not commend itself to the Council's Surveyor; and, after the loan had been sanctioned and the contract entered into, he had further communication with the Board. As the result, he obtained from the Council authority to vary the contract, reverting to the original method of laying the brick and concrete; and in March, 1898, he gave the Contractor a written order for this deviation. The work proceeded; and on Oct. 4, 1898, the Surveyor gave the Contractor a final certificate for payment. In September, 1902, Mr. Jones resigned his position on receiving a similar appointment at Hythe; and he was succeeded at Teignmouth by Mr. Vincent Smith, the present Surveyor. Acting upon the instructions of the Council, Mr. Smith applied tests to the reservoir in February last year. An examination showed the reservoir to be in a serious condition in regard to the concrete lining, and that it was in many ways very defective. The Council called in Mr. George Chatterton, of Westminster, a water engineer of considerable experience, whose report entirely confirmed the fears entertained. What was complained of was that the composition of the concrete used was not in accordance with the contract, and that, owing to deficiency in thickness, it did not prove a sufficient waterproof lining. One of the results of the badness of the concrete was that there were cracks or fissures which caused the reservoir to leak badly. The Council asked for such a sum as would cover the repairs which they deemed were necessary.

At this point, objection was taken by Mr. Clavell Salter, K.C. (who, with Mr. J. B. Matthews, appeared for the defendant), to the reading of the document containing a written order for a deviation in the method of carrying out the work, and stated that it never reached the hands of Mr. Slocombe or the Clerk of Works. He denied that there had been any breach of contract, and submitted that all that was done was by the verbal instructions of the Council's Surveyor. The order given to Mr. Slocombe by the latter was to put perforated bricks on the sides and bottom of the reservoir and concrete on these, involving an additional expenditure of £350.

The first witness called was Mr. Vincent Smith, the present Surveyor to the District Council. He stated that, as the result of his tests of one compartment of the reservoir, he discovered a leakage of 9000 gallons per day, spreading over seven days. In the other compartment he found on the floor and on the east and south slopes cracks averaging 3-16ths of an inch in width, from which water bubbled. He also found a hole through the division wall communicating between the two compartments of the reservoir. At the mouth, this hole was 2½ inches wide, narrowing to 1 inch to 1¼ inches in the centre. The concrete was soft and friable, composed mainly of flints to which yellow clay adhered, and the majority of which could be withdrawn from the cement by hand. The bricks, instead of being of the very best quality, were "bats," and the cement did not adhere to them. After making good the cracks, he again filled the reservoir; but, notwithstanding the cracks being filled, there was still considerable loss of water. He attributed the cracks to the bad concrete. The majority of the cracks which were on the slope were found where the concrete was very thin. It was not properly washed, and its composition was not according to the specification. What was further required as a remedy for the defects was that the whole of the floor and slopes of the reservoir and the division wall should be lined with bitumen sheeting protected by a layer of 4 inches of concrete. The sum already spent in stopping the cracks was £108, the cost of re-lining would be £1591, and that of taking out all the bad concrete and substituting good was £2488. The final certificate showed that Mr. Slocombe was paid £6915. He estimated the loss of water by leakage in seven days at one period at 63,196 gallons; being 9028 gallons per day. The total loss through leakage since the construction of the reservoir had been upwards of 9 million gallons; and, putting the value of this at 11¼d. per 1000 gallons, there was a loss of £456. In addition, he estimated a loss of £250 through the reduced capacity of storage, and a similar sum for loss of the use of the reservoir during alterations.

In cross-examination, witness was questioned on reports made by his predecessor (Mr. Jones), showing that, as the result of tests then made, the reservoir was not leaking, or only very slightly. He did not suggest that the hole in the division wall was made fraudulently; but the effect was that it would maintain the water in both compartments of the reservoir at the same level. The Clerk to the Council had written to Mr. Slocombe, stating that the hole had been "artfully concealed;" but he (witness) did not furnish Mr. Dell with information on which he founded that opinion. He did not give any opinion on his discovery; he simply told the Council what he had found, and invited them to see it. They did so, and expressed themselves strongly. In reply to the Referee, witness said he did not consider the cracks in the roof were caused by subsidence. There was nothing in the specification to justify the way in which the bricks were laid. He did not agree with the suggestion that they were put underneath the concrete to allow of a free flow of water.

Mr. Smith was followed by Mr. George Chatterton, who said he inspected the reservoir on the 11th of August last. If the concrete had been made in accordance with the specification, a lining of 12 inches of it would have been proper and sufficient for the reservoir, and would make it sound, water-tight, and strong, with the bricks below as well as above. As a matter of design, he would have preferred the bricks on the top of the concrete; but with the bricks below, there was no reason why the reservoir should not still be water-tight with the thickness of concrete mentioned. The bricks were uneven, having been carelessly laid. This, however, was no excuse for diminishing the amount of concrete. The thickness of the concrete was always less than was required by the specification, and in some cases very much less. The average was 8⅞ inches instead of 12 inches; in one instance it was 7½ inches, and in another only 5⅞ inches. The quality of the concrete was very inferior throughout; it was badly made, and badly mixed. There was a want of uniformity about it; and it was porous, soft, and friable. Owing to the flints used not having been carefully washed, so as to get the clay out, there was no adhesion to the concrete; and under these conditions a water-tight reservoir could not be expected. It looked as if old material had been employed. The cracks were due to bad grouting. There were no indications of settlements on either of the banks. If there had been any subsidence, the new piers and the brickwork attached would have shown bad signs, and the roof would have been all to pieces.

In cross examination, witness said inequalities of the soil could be made up with brickwork. If there were any boulders in the bank, they would be removed, and the space should have been filled up with concrete, so that there should be no "rotten" places. The proper way to test was to see the cement concrete in bulk. Some of the concrete taken from the holes was composed of shingle, sand, and flints. In portions there were no flints. In No. 2 compartment, the lower part of the concrete contained cement and flints, and in No. 1 shingle and cement. The shingle from Teignmouth beach would make good concrete if washed. The reason for washing was to get all earthy or greasy substances from it. It was not desirable that concrete should be placed against soppy clay, as it would kill the cement. He agreed with Mr. Smith's theory as to the cracks in the roof.

The next witness was Mr. Bertram Blount, of Westminster, who described the samples of concrete submitted to him as poor, weak, and friable. One taken from the floor of the reservoir, besides being poor, was very dirty. The concrete in No. 2 compartment was rubbishy; it was not water-tight. The concrete in No. 1 compartment was mediocre, and would not be water-tight. There could be no bond between the cement and the aggregate. It was dirty, deficient in cement, and improperly mixed.

This closed the evidence for the plaintiffs.

In presenting the case for the defendant, Mr. Clavell Salter remarked that five years after Mr. Slocombe received his final certificate for the work he had executed he received a letter demanding from him between £2000 and £3000, and bringing against him a charge which could only be described as one of fraud, and an attempt on the part of the District Council to dissociate themselves from their agent. The case was one in which the onus of proof rested heavily upon the plaintiffs. The two issues to be tried were whether they had proved to the satisfaction of the Referee that there were breaches on the part of Mr. Slocombe of the contract he made with the Council. If there were, there arose the question whether the disaster which had attended the reconstruction of the reservoir had been truly and substantially caused by any breach which was brought home to the defendant. With regard to the terms of the contract under which the job was undertaken and carried through, in connection with the question of material—upon which the case almost entirely turned—the clause provided that all material used, prepared, or intended to be used by the Contractor, should vest in the District Council on delivery at the works, and that, if such materials were considered unsound and improper, their Surveyor might reject and remove them. He could also do this if he found he had been misled as to their quality; and the fact that the material in question was inspected and not rejected, was strong evidence of approval and assent on the part of the Council's agents, the Surveyor and Clerk of Works. Having pointed out that the contract in question was a piecework one at agreed rates, and not for a lump sum, the learned Counsel referred to deviations in the work carried out by Mr. Slocombe in accordance with the instructions of the then Surveyor to the Council, and contended that no employer could say that it was a breach of contract to do that which was ordered and approved. If the members of the District Council had ordered deviations, and the Contractor had carried them out, they could not afterwards say that such deviations were breaches of the contract; and, in acting as they did by agent, the same thing applied. Putting the case on this basis, he suggested that, provided the instructions of the Surveyor were within the ostensible scope of his agency, his employers were bound by it. The main question was this: Did the plaintiffs, by their agent, accept, ratify, and order that which was actually and in fact done? If they did, there was no breach of contract. As to the thickness of the concrete used, the nature of the contract was such that the Contractor would lose rather than gain by thinning the material. The meaning of the contract as a whole was that the Surveyor had a right to deviate within the ordinary limits, and that there was nothing to take away from him the ordinary power delegated to a Surveyor to deviate by verbal orders. Nor was there anything in the contract which informed the Contractor that the Surveyor's agency was limited as regarded deviations.

At this point in the learned Counsel's address, the Referee interposed the remark that the Surveyor could not give verbal instructions to alter the character of the concrete or its thickness, so as to render it unfit for the lining of the reservoir. Counsel thereupon asked what position this put the Contractor in. After receiving orders, was he to say that he did not agree with such a policy, and refuse to obey them? The Referee replied that he thought he should do so. The Contractor should have required that the orders should be put in writing. Then,

said Counsel, if the Contractor was to be held responsible for carrying out orders which ought to have been put in writing and were not, he must take what were held to be the legal consequences.

Continuing his address, Mr. Clavell Salter referred to the question of the composition of the concrete. He said the Contractor acted in good faith in doing as he was told, and washed the flints used to the best of his ability; and it was not his fault that he did not achieve a very difficult and almost impossible task in this respect. The concrete was properly mixed and composed, and was fairly in accordance with the contract, although experts would say that it would have been much better if the shingle had been of larger size. As to the resulting damage, if there was a breach of contract, the disastrous state of the reservoir was not due either to the quantity or the quality of the concrete or bricks, but to subsidence. The question, then, was whether the condition of the reservoir was due to subsidence or to bad concrete. If the material had been porous, as alleged, the reservoir would not have held water to the fair extent it had done the last five years.

The first witness called for the defendant was Mr. Charles E. Ware, of Exeter, who stated that, taking the various depths of concrete and rendering of floors of both compartments of the reservoir, he found an average thickness of 11⅜ inches, and for the slopes 11½ inches. In some other parts the thickness was in excess of the maximum. The concrete he tested fairly complied with the specification. He was bound to say he saw some clay adhering to the flints. He never suggested that it was carried there by subsoil water. He certainly disapproved of the method of laying, as it permitted the subsoil water to find its way under the concrete. He attributed the leaks to settlement of the embankments. The reservoir was badly designed to carry the weight of water. He admitted that there were serious deficiencies in the thickness of the concrete to the extent of at least one-third. The composition of the concrete was not good, but was fairly up to the specification. It was not uniform. Shingle, if washed after being taken from Teignmouth beach, was not suitable for concrete; but he would sooner use the shingle than flints.

The Clerk of Works at the reservoir (Mr. W. H. M'Owen) was the next witness. He said he did not hear any orders given by the Surveyor to Mr. Slocombe to use the old concrete, which was properly washed. The excavation was deeper in some places than in others, because of large boulders, some of which were removed and others left. Where boulders were taken out concrete was put in, in some places to a depth of 18 inches and others of 2 feet. Where they were not taken out, it caused the concrete lining to be several inches thinner. This was done with the Surveyor's knowledge. The concrete put down was in accordance with the contract; and the bricks used for lining the reservoir were ordered by Mr. Jones and were suitable. When the reservoir was opened on Feb. 3, 1899, the sides and bottom were perfectly dry, and there were no signs of cracks. He first heard of an alteration in the specification from Mr. Jones, who told him to lay bricks, then concrete, and then "render;" but he did not give any instructions as to the thickness of this. He (witness) never suggested, while the job was going on, that it was impossible to lay good concrete. The Contractor did his best, and so did he (witness), to get proper concrete; but this was bad in principle.

Two other witnesses (one of them the Chairman of the Water Committee) having given evidence, Mr. Slocombe was called. He stated that when he undertook the contract no plans were supplied to him. The Surveyor or the Clerk of Works gave the workmen instructions as to the depth of the excavation. It was by Mr. Jones's instructions that the old concrete was washed and used up. He was ordered by him to put the bricks next to the soil and the concrete over, instead of the reverse; but he never had anything to this effect in writing. As to the concrete, when the Surveyor or the Clerk of Works wanted it thick, they had it so; and the excavation and concrete were entered up every month by Mr. Jones, who gave monthly certificates. He had no intimation that his work was bad, and no claim was made until October last year. He received the interim and final certificates of the Surveyor, and also a letter from him that he (witness) had given him every satisfaction.

In delivering judgment, the Referee commented upon clause 8 of the specification, which he said was a strange one, inasmuch as it gave the Surveyor power to be the sole judge of the work; and if at any time its quality was disputed, the District Council could claim damages. Another clause provided that all orders for work and deviations should be in writing. It had been said it was hard to call upon the Contractor five years after the completion of the work; but he (the Referee) did not see where the hardship came in. The Contractor was bound to carry out the work he agreed upon; and it might have been a matter of congratulation that the defects were not discovered before. Mr. Slocombe was in a dilemma. He had done work and had no written order to produce. In this particular, he had committed a breach of the contract. The bricks used might have been good of the sort, but they were not the best as required. The concrete was bad, and the thickness equally so, in spite of its being made and laid with the acquiescence of the late Surveyor and the Clerk of Works. There would be a verdict for the plaintiffs for £2000 with costs, but with stay of execution for fourteen days, to be extended to the hearing of an appeal, on the defendant paying into Court, or giving security (to the satisfaction of the Master) for, £2000.

The West Middlesex Water Company's Dividends.

The case of Metropolitan Water Board *v.* West Middlesex Water-Works Company was disposed of last Thursday in Mr. Justice Farwell's Court. Mr. Shaw, who appeared for the plaintiffs, said the action was brought to restrain the defendants from paying dividends exceeding 10 per cent.; and the pleadings had been closed, and an interim injunction granted until the trial. Judgment had now been given by the House of Lords in another case, which made it impossible for the defendants to contest the question further; and, subject to his Lordship's consent, they were now willing to have the injunction made perpetual. Mr. Kemp, for the defendants, having expressed his assent, his Lordship made the order accordingly.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

Half-Yearly Report and Accounts.

The following is the report on the working of the Company during the six months ending June 30, which, with the accounts, will be submitted to the proprietors on Friday:—

The accounts for the past half year show that, after providing for the fixed charges, and setting aside £10,000 for the half year towards the redemption fund, in accordance with the provisions of the Company's Act of 1903, there remains a balance, including the amount brought forward, available for distribution of £609,326 7s. 9d., out of which the Directors recommend a dividend on the ordinary stock at the statutory rate of £4 8s. per cent. per annum, which will absorb £335,350 8s., leaving the sum of £273,975 19s. 9d. to the credit of the current half year. The dividend for the corresponding half of 1903 was at the same rate, and the amount then carried forward was £116,530 3s. 6d.

This satisfactory result, which is mainly due to the increase in the quantity of gas sold, to the lower price of coal, and to the enhanced prices obtained for some of the residual products, enables the Directors to reduce the price of gas by 1d. per 1000 cubic feet as from July 1.

The quantity of gas sold during the half year was 10,641,483,000 cubic feet; being an increase of 3·45 per cent. over the quantity sold during the corresponding period of 1903. The net increase in the number of automatic meter consumers during the half year was 16,084; and the number of stoves (ordinary and automatic) sold and let on hire shows an increase of 16,431.

The Directors have to report that the annual contracts for the supply of coal have been made at prices somewhat below those of last year.

A Departmental Committee was appointed by the Board of Trade in January last "to inquire and report as to the statutory requirements relating to the illuminating power and purity of gas supplied by the Metropolitan Gas Companies, and as to the methods now adopted for testing the same, and whether any alteration is desirable in such requirements or methods, and, if so, whether any consequential alteration should be made in the standard price of gas." The Committee held many meetings and heard evidence from the Gas Referees and representatives of the London County Council and of the Metropolitan Gas Companies. The report of the Committee has recently been issued, and contains several important recommendations. To this Company, under its present regulations as to illuminating power, these recommendations are, on the whole, satisfactory. Particularly welcome is a proposal to grant some much-needed relief from the unnecessarily stringent regulations with regard to sulphur purification under which the Metropolitan Gas Companies have been compelled to carry on their business in the past. Legislation will, however, be necessary before effect can be given to these recommendations.

During the present parliamentary session, there have been, as was anticipated, but few measures directly affecting this Company. In view of the appointment of the Departmental Committee above referred to, the London County Council, early in the session, withdrew the Gaslight and Coke and other Gas Companies' Acts Amendment Bill, which was promoted for the purpose of altering the procedure in gas-testing appeals. The London Port and Docks Bill, to which reference was made in the last half-yearly report, has also been withdrawn by the promoters. The Company opposed the Electric Lighting Bill of the St. Marylebone Borough Council, and succeeded in obtaining the insertion of a clause the object of which is to protect the Company as a ratepayer, and also to secure it against undue competition from a rate-aided electric light undertaking. The usual clauses have been inserted in other Bills protecting the Company in case of interference with its mains.

The Court of Directors has been furnished by the several Engineers of the Manufacturing and Distribution Departments respectively with the usual certificates that all the Company's plant has been maintained in thorough efficiency.

The accounts accompanying the report consist of the usual statements, from which we take the following particulars:—

The statement of capital (stock) sets forth that the total paid up is £9,466,500; added on conversion, £12,176,565—total amount authorized, £21,643,055. The statement of loan capital stands thus: Total paid up, £2,844,000; added on conversion, £1,479,975; unissued, £750,000—total amount authorized, £5,073,975.

The capital account shows receipts (with premiums, £1,586,807) to the amount of £27,553,847 11s. 9d. The expenditure is shown in the following items:—

Expenditure to Dec. 31, 1903			£13,139,522 11 1
Expenditure during the half year to June 30, 1904—viz.,			
New and additional mains and service-pipes	£17,281 17 2		
Do. do. meters	30,091 2 9		
Do. do. stoves	16,542 15 6		
		£63,915 15 5	
Sale of surplus land	£408 9 2		
Sale and depreciation of plant	19,477 13 2		
		19,886 2 4	
			44,029 13 1
Total expenditure			£13,183,552 4 2
Nominal amount added on conversion			13,656,540 0 0
			£26,840,092 4 2
Balance of capital account			713,755 7 7
			£27,553,847 11 9

The following is the revenue account :—

Expenditure.

June Half Year, 1903.		£ s. d.	£ s. d.
	Manufacture of Gas—		
£671,030	Coal and oil into store	618,200 3 3	
16,660	Salaries of Engineers and other officers at works	15,757 10 0	
123,925	Wages, gas making £124,652 10s. 1d.	141,891 3 6	
17,228	,, sundries . £17,238 13s. 5d.		
47,563	Purification, including £19,622 10s. 10d. for labour	53,592 13 1	
168,248	Repair and maintenance of works and plant, materials and labour, less received for old materials, £5042 13s. 1d	164,806 12 2	
	Distribution of Gas—		1,024,308 2 0
36,438	Salaries and wages of officers (including Rental Clerks)	38,511 7 1	
40,948	Repair and maintenance of mains and service-pipes	63,769 4 8	
29,159	Repair and renewal of meters	27,968 6 11	
27,893	Repair and renewal of stoves	33,926 9 10	
			164,115 8 6
17,004	Public lamps—Lighting and repairing	..	16,393 13 4
	Rents, rates, and taxes—		
5,967	Rents payable	5,900 19 2	
138,929	Rates and taxes	142,035 15 11	
			147,936 15 1
	Management—		
2,750	Directors' allowance	2,750 0 0	
217	Company's Auditors and Assistant	216 16 0	
7,544	Salaries of General Manager, Secretary, Accountant, and Clerks	7,073 14 9	
23,658	Collectors and Cashiers	24,040 4 6	
6,555	Stationery and printing	7,657 13 6	
3,503	General charges	3,068 7 3	
			44,806 16 0
2,400	Parliamentary charges	..	380 0 0
1,326	Law charges	..	1,553 7 4
4,882	Bad debts	..	4,496 12 2
500	Depreciation fund for Works on Leasehold Lands	..	500 0 0
15,596	Annuities	..	18,584 3 6
665	Workmen's compensation account	..	717 5 1
5,000	Stamp duty	..	..
	Public officers—		
1,259	Gas Referees and Official Auditor	1,252 18 2	
735	Public testing-stations	680 9 10	
			1,933 8 0
£1,416,582			1,425,587 11 0
580,494	Balance carried to net revenue account		638,871 1 6
£1,997,476			2,064,458 12 6

Receipts.

June Half Year, 1903.		£ s. d.	£ s. d.
	Sale of gas—		
	Per meter, at 3s. and 2s. 3d. per 1000 cubic feet		
£1,456,545		1,491,522 9 8	
74,778	Public lighting and under contracts	69,047 10 4	
			1,563,570 0 0
£1,531,323			
29,310	Rental of stoves	..	32,228 12 1
	Residual products—		
£266,535	Coke, less £39,345 18s. 7d. for labour, &c.	288,840 12 5	
13,698	Breeze, less £3199 12s. 4d. for ditto	13,951 0 10	
70,335	Tar and tar products	65,041 0 9	
81,750	Ammoniacal liquor and sulphate of ammonia	96,133 10 9	
			463,963 4 9
£432,318			
£4,250	Rents receivable		4,411 0 8
275	Transfer fees		282 15 0
£1,997,476			2,064,458 12 6

The balance available for division (after setting aside £10,000 towards the redemption fund) is £609,326 7s. 9d; and the statement showing how it is proposed to appropriate it is as follows :—

June, 1903.		
£65,147 ..	Net balance brought rom last account	£175,417 5 0
386,733 ..	Net revenue for the half year	443,909 2 9
£451,880		£619,326 7 9
(£4 8s. per cent.)	A dividend on the ordinary stock—	
£335,350 . .	£4 8s. per cent. per annum on £15,243,200	335,350 8 0
£116 530 ..	Balance carried to next account	£273,975 19 9

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on June 30 were as follows: Reserve fund, £58,077 19s. 9d.; insurance fund, £93,104 16s. 8d.; and depreciation fund, £56,365. The insurance fund had to bear in the pas. half year a sum of £104 13s. 5d., the value of plant destroyed by fires in the Company's district.

The following statements relate to the working :—

Statement of Coals Used, &c.

Description of Coal.	In Store Dec. 31, 1903.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1904.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	272,616	768,020	875,794	12,513	152,329
Cannel	14,292	2,456	*1,735	..	15,013
Total	286,908	770,476	877,529	12,513	167,342

* In addition to this quantity of cannel, 7,539,277 gallons of oil and spirit were used during the half year.

Statement of Residual Products.

Description.	In Store Dec. 31, 1903.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1904.
Coke—tons	23,935	551,524	124,741	409,838	40,880
Breeze—tons	1,248	100,339	14,163	84,933	2,491
Tar—gallons	702,644	9,133,314	9,120,364	13,277	702,317
Ammoniacal liquor—butts	17,548	262,741	268,387	..	11,902

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights and Under Contracts. (Estimated.)	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*11,297,719	466,502	10,174,981	10,788,274	49,004
†11,042,504	488,805	9,797,403	10,434,181	48,696

* Including 2,315,312,000 cubic feet of "oil gas." † June half year, 1903.

The remaining statement is the balance sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £117,878; oil and petroleum spirit, £53,822; coke, £26,259; tar and ammoniacal liquor and products, £101,859; and sundries, £242,554. The figures this time last year were: Coal, £128,009; oil and petroleum spirit, £30,941; coke, £3754; tar and ammoniacal liquor and products, £89,400; and sundries, £242,515.

SOUTH METROPOLITAN GAS COMPANY.

Half-Yearly Report and Accounts.

The following is the report of the Directors of this Company for the six months ending the 30th of June, which, with the accounts for this period, will be presented at the half-yearly meeting on the 10th inst.

The reduction in the price of gas from 2s. 3d. to 2s. 1d. per 1000 cubic feet from Christmas last has reduced the revenue from the sale of gas in the half year, and left in the pockets of the consumers rather over £50,000. With this great drop in receipts, the Directors expected to have to resort to the balance brought forward to enable them to pay the dividend. They have, however, the gratification to inform the proprietors, and their partners, the consumers, that there is the substantial surplus of £21,904 on the half-year's working, after allowing for an increase of dividend as well as the dividend on the issue of £100,000 of new stock in January last—together £7875 more than in the corresponding half of last year.

Under these circumstances, a further reduction of price was the obvious course to take. The Directors therefore announced a reduction from Midsummer last to 2s. per 1000 cubic feet—the lowest figure ever reached in London. This reduction of 1d. is equivalent to rather over £25,000 on the sale of gas in a half year, and exceeds the surplus of the past half year by £3176 only.

There has been an increase in the gas sold of 4 per cent.; but ordinary consumers have increased nearly 2 per cent., ordinary cooking-stoves about 6 per cent., slot meters about 11½ per cent., and stoves used with the same over 15 per cent. The increase of consumption is therefore much less than the growth of the business, again proving that the reduction of illuminating power does not cause an increased consumption of gas such as was foretold by the London County Council witnesses against the Company's Bill of 1900.

The dividend payable under the sliding-scale is at the rate of £5 12s. per cent. per annum. The Directors recommend the payment of a dividend at the rate of 5½ per cent., carrying the odd 2s. per cent. undivided, or £3125, to the reserve fund. They also think it desirable to make the insurance fund a round £100,000, and therefore have carried ¼ per cent. on the paid-up capital, or £8804 12s. 10d., to that fund. The balance carried forward will amonnt to £65,374 11s. 2d.

These satisfactory results are due to various causes. Coal cost 8d. per ton less, or a saving of some £19,000; and there has been an unexpected gain of half this amount on coke, and tar and ammonia—all being better than last year. Then some 200 cubic feet more gas has both been made and sold per ton of coal; the latter amounting to 10,530 cubic feet. In fact, the improvement has been general; and one of the main causes must be the great interest the chief officers of the Company, backed by the loyal support and co-operation of their subordinates and the workmen, have shown in promoting its prosperity.

In this connection, the attention of the proprietors is drawn to the large amount of the co-partnership bonus for the past twelve months—viz., 8¾ per cent. on salaries and wages, £34,341 11s. 1d. There can be only two grounds of justification for the distribution of this large sum among the officers and workmen of the Company. It must be earned by good work, and the avoidance of waste of time and materials, and it must be rightly used by the recipients. Unless it does them permanent good, it will certainly fail, sooner or later, to produce a good effect upon them, and then it will not be earned. To pay the full market rate of wages and then to add 8¾ per cent. (it will be 9¾ per cent. at the present price of gas) at the cost of consumers and shareholders could not be justified except as above indicated. The Directors fully believe that the money is earned by the better work of the great majority of officers and workmen who take a real interest in the Company, the indifferent among them happily becoming fewer year by year. As to the second point, the Directors know that all but a small minority of their employees have greatly improved their position, for nearly the

whole of their bonus has been saved and invested in the Company. The employees now hold in the Company's stock at the market value and on deposit with the Company at interest a grand total of over £225,000; while, in addition, not a few have purchased houses by means of these savings.

This point has been dealt with at some length because the scheme for the election of Workmen or Employee Directors requires the Board to "specially report to the shareholders on the working of the scheme" every third year. That time is now due. They have to report that the three Employee Directors – one clerk and two workmen—have continued to work to the entire satisfaction of all their colleagues, and, as they believe, also to the advantage of the Company.

An event of great importance to the gas industry, particularly in London, has been the appointment and report of a Departmental Committee, appointed by the Board of Trade, "to inquire and report as to gas testing in the Metropolis." Their most important recommendations are: That the test for sulphuretted hydrogen should be made less stringent; that the obligation to remove the sulphur compounds should be abolished; and that it shall not be obligatory on the controlling authority to test gas on Sunday. They do not consider testing by the portable photometer necessary; and they do not agree with the request of the London County Council that the parliamentary bargain made in 1900, when the standard illuminating power of this Company's gas was reduced to 14 candles, should be interfered with. There are one or two points as to methods of testing with which the gas industry does not agree; and the Committee express no opinion as to the advisability or otherwise on the question of reducing the illuminating power. Their authoritative declaration on the sulphur compounds will free the London Companies and others in the Provinces of the necessity to use lime, which is the cause of much nuisance in the neighbourhood of gas-works. Its abolition will be a great relief to the surrounding inhabitants, and to the managers and workmen. On the whole, the work of this Committee must be considered satisfactory, for it will give more freedom to the Companies to work for the general good of their customers and themselves.

The following are the principal portions of the accounts:—

The first two statements relate, as usual, to the stock and loan capital. The former sets forth that the standard rate of 4 per cent. is payable on £6,011,224 and £238,776 (Act of 1901) of stock; while the latter shows that the loan capital, the rate of interest on which is 3 per cent., amounts to £1,798,994 and £33,706 (Act of 1901). The third statement is the capital account. It stands as follows: Amount received, £5,039,894; nominal amount added by conversion (less premium), £3,042,806 – total, £8,082,700. The items of expenditure are as follows:—

Capital account to Dec. 31, 1903			£4,638,232 3 8
Expenditure during half year to June 30, 1904, viz.—			
New buildings and machinery in extension of works	£1,696 17 2		
Purchase of new land and incidentals	43,665 0 0		
New and additional mains and services	9,338 0 7		
New and additional meters	13,677 14 9		
New and additional stoves	8,595 2 2		
		76,952 14 8	
Total expenditure			£4,715,184 18 4
Balance			324,709 1 8
			£5,039,894 0 0
Nominal amount added by conversion, less premium			3,042,806 0 0
Total			£8,082,700 0 0

The following is the revenue account:—

Expenditure.

Manufacture of gas—			
Coal into store, including £26,028 0s. 9d. for labour	£325,774 6 4		
Purification, including £7318 6s. 3d. for labour	20,702 4 3		
Salaries of Engineer and Officers at works	11,370 5 2		
Wages (carbonizing)	59,467 4 2		
Repairs and maintenance of works and plant, including £52,174 8s. 6d. for labour, less £3905 19s. received for old materials	116,475 13 9		
		£533,739 13 8	
Co-partnership for 12 months, to June 30, 1904	34,341 11 1		
Less on account	16,000 0 0		
		18,341 11 1	
Distribution of gas—			
Repair, maintenance, and renewal of mains and service-pipes, including £23,573 9s. 9d. for labour	£37,819 8 3		
Salaries and wages of officers, including Rental Clerks	16,041 14 9		
Repairing and renewals of meters, including £4910 13s. 8d. for labour	20,106 8 7		
Repairing and renewals of stoves, including £10,073 8s. 4d. for labour	15,913 12 11		
Gas-fittings (labour)	8,446 3 10		
		98,327 8 4	
Public lamps, including £10,182 12s. 5d for labour, and £5127 17s. for materials, less £14,544 15s. received for maintenance		765 14 5	
Rents, rates, and taxes—			
Rents payable	£889 19 5		
Rates and taxes	35,781 2 0		
		36,671 1 5	
Management—			
Directors' allowance	£2,531 18 0		
Salaries of Secretary, Accountant, and Clerks	3,267 6 7		
Collectors { Ordinary	5,728 7 1		
Collectors { Slot meter	6,116 19 3		
Stationery and printing	3,121 9 6		
General charges	7,102 2 6		
Company's Auditors	112 10 0		
		27,980 12 11	
Law charges	£2,616 3 10		
Parliamentary charges	2,111 2 3		
		4,727 6 1	
Bad debts		1,603 1 7	
Pensions and officers' and workmen's superannuation, sick, and accident funds		5,466 8 6	
Gas Referees and Official Auditor		246 6 0	
Leasehold renewal fund		300 0 0	
Total expenditure		£728,169 4 0	
Balance carried to net revenue account		223,389 13 4	
		£951,558 17 4	

Receipts.

Sale of gas—			
Lady-Day, at 2s. 1d. per 1000 feet	£367,733 9 1		
Midsummer, at 2s. 1d. per 1000 feet	236,866 2 1		
	£604,599 11 2		
Public lighting	15,438 8 11		
		£620,038 0 1	
Meters in use (275,872)—			
Company's meters at rent: Ordinary, 102,559; slot, 164,276	£29,722 7 4		
Company's stoves at rent: Ordinary, 65,142; slot, 140,070; fires, 17,209	23,779 15 2		
		53,502 2 6	
Residual products—			
Coke, less £2083 5s. 3d. for cartage; £15,895 5s. for labour, &c.	£173,950 14 11		
Breeze, less £491 1s. 10d. for cartage; £2836 17s. 8d. for labour, &c.	8,715 8 9		
Tar and tar products	38,997 13 2		
Sulphate of ammonia	54,643 7 6		
		276,307 4 4	
Rents receivable		1,610 17 11	
Transfer fees		100 12 6	
Total receipts		£951,558 17 4	

The net revenue account shows a sum of £240,374 applicable to dividend on the ordinary stock. Following this are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on the 30th of June last were as follows: Reserve fund, £157,478; renewal fund, £22,169; insurance fund, £100,976.

The statements furnishing manufacturing details are as follows:—

Statement of Coal.

In Store Dec. 31, 1903.	Received During Half Year.	Carbonized During Half Year.	Used During Half Year.	In Store June 30, 1904.
Tons. 132,709	Tons. 497,758	Tons. 571,621	Tons. 856	Tons. 57,990

Statement of Residual Products.

Description.	In Store Dec. 31, 1903.	Made During Half Year.	Used During Half Year.	Sold During Half Year.	In Store June 30, 1904.
Coke—cwts.	235,886	7,062,637	1,737,021	5,150,193	411,309
Breeze—yards	7,873	147,605	55,989	93,668	5,821
Tar—gallons	393,079	5,705,525	34,201	5,475,347	589,056
Ammoniacal liquor—butts	15,165	180,101	183,241	..	12,025

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Total Quantity Accounted for.	Number of Public Lamps.
	Public Lights (estimated).	Private Lights (per Meter).		
Thousands. 6,235,892	Thousands. 215,110	Thousands. 5,804,057	Thousands. 6,096,923	19,963 incandes't 2,486 flat flame

The remaining statement is the balance-sheet, which gives the value of the stores in hand at the close of the half year as follows: Coal, £32,994; coke and breeze, £13,165; tar, sulphate, and ammoniacal liquor, £40,850; and sundries, £230,056. The figures this time last year were: Coal, &c., £31,561; coke and breeze, £4964; tar, sulphate, and ammoniacal liquor, £14,370; and sundries, £230,015. A sum of £54,551, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £22,018. The figures last year were £22,887 and £18,402.

BRENTFORD GAS COMPANY.

Half-Yearly Report and Accounts.

In the report which the Directors of the Brentford Gas Company will present at the half-yearly meeting on Friday, they state that in the six months ending June 30 there was an increase to the extent of about 5¾ per cent. in the sale of gas, compared with the corresponding period of 1903. They point to this as a satisfactory feature of the half-year's working; but, on the other hand, there was a considerable depression in the market for tar. As the result of the growth of the business, a reduction of 2d. per 1000 cubic feet was made in the price of gas at Lady Day—bringing it down to 2s. 9d.; and the Directors confidently anticipate that the effect will be a further increase in the use of gas in the district. The works of the Company, both at Brentford and Southall, have been maintained, under the supervision of the Engineer and Manager (Mr. James Husband), in efficient order. The accounts accompanying the report show that up to the end of June last the expenditure for capital purposes had been £1,088,769, of which £13,277 was incurred in the six months covered. Giving credit for £14,026 written off for depreciation on stoves, prepayment meters, fittings, &c., the total stands at £1,074,743; leaving a balance of £40,567 unexpended. The total revenue was £198,884, compared with £193,593 in the corresponding period of last year; while the expenditure was £151,615, against £146,393. The balance carried to the profit and loss account is £47,269, compared with £47,200. The sum available for distribution is £95,892, out of which the Directors recommend the payment of dividends at the rates of 5, 12, and 9 per cent. per annum respectively on the preference, consolidated, and new stocks. The working statement shows that 76,722 tons of coal, and "solar" oil equal to 29,929 tons, were used in the manufacture of 1,142,139,000 cubic feet of gas, of which 1,045,385,000 cubic feet were sold and 1,060,385,000 cubic feet were accounted for; the estimated quantities of residuals produced being: Coke, 47,952 tons; breeze, 5979 tons; tar, 884,269 gallons; ammoniacal liquor, 20,205 butts of 108 gallons.

SULPHATE OF AMMONIA COMMITTEE.

The Annual Meeting of the subscribers was held last Tuesday at 4, Fenchurch Avenue, E.C. The report submitted by the Executive for the year ending June 30 contained the following paragraphs:—

The season of 1903, by reason of the abnormal rainfall and of the lack of sunshine which characterized it, was a disastrous one for agriculturists generally; and these adverse climatic conditions made themselves felt in connection with the Committee's work by causing a diminution in the number of agricultural competitions which were carried out for the Committee's prizes. The number of competitions brought to a successful issue in 1903 was 89, as compared with 99 in the previous year. Ten competitions, for which arrangements had actually been made, were abandoned; and there is no doubt that but for the weather conditions which prevailed throughout the spring and early summer, societies which would otherwise have organized competitions abstained from undertaking the work. In support of this, it may be mentioned that, for the current season, during which the weather conditions have been far more favourable, 107 competitions have been arranged. The number is in excess of any figures for previous years. Six grain trials were started; but, owing to the adverse conditions, only one was completed. Cattle feeding trials were again carried out in Banffshire and Morayshire; and our Technical Adviser states that they gave better results than the excellent trials of the preceding year.

The report on the agricultural experiments and competitions carried out during 1902, and on the experiments at the Cork International Exhibition, 1903, accompanied by full tabulated results, was duly published; and about 43,000 copies of the 50,000 copies printed were circulated throughout the United Kingdom. The Committee adopted their usual practice of advertising in the principal agricultural papers and periodicals during the months of February to May inclusive. The pamphlet "A Few Facts about Sulphate of Ammonia, by a Practical Farmer," has been revised, and brought up to date by the author, and re-issued in a more convenient form.

In consequence of the difficulty they experienced in obtaining accurate weekly returns of shipments of sulphate of ammonia, the Executive Committee, in August last, discontinued the issue of them with the market report. Since then, and in place thereof, a monthly statistical statement, based on official returns, has been supplied. The Executive take this opportunity of thanking those members of the Committee who have assisted them in the work of compiling the market report by furnishing particulars of prices at various ports.

Special efforts have been made during the past year to secure new subscribers, with the result that 45 additional members, representing an aggregate of about 6000 tons of sulphate of ammonia, have joined the Committee. The quantity of sulphate of ammonia represented by the subscriptions for the year under review shows a very gratifying increase, compared with the tonnage for the preceding year; the quantities for the respective periods being: July, 1902, to June, 1903, inclusive, 119,739 tons; July, 1903, to June, 1904, inclusive, 128,550 tons—increase 8811 tons.

The Auditors to the Committee, Messrs. Wood, Drew, and Co. (late Lass, Wood, and Drew), offer themselves for re-election.

The Executive Committee are of opinion that, in spite of the falling off in the number of agricultural competitions during the period under review—a circumstance directly attributable to adverse weather conditions—they may be well satisfied with the year's work.

The number of competitions organized for the current season and the large addition to the list of subscribers are evidence of the continued and growing interest which both agriculturists and manufacturers are taking in the work. The Executive Committee feel, however, that, in view of the considerable increase in the production of sulphate of ammonia, both in the United Kingdom and abroad—to a large extent due to the establishment of extensive coke-oven works—a more united effort should be made on the part of manufacturers to assist in the good work. The active co-operation of members in the endeavour to still further increase the number of subscribers would be heartily welcomed by the Executive.

The report was adopted; and Mr. W. G. Blagden was re-elected Chairman, and Mr. Milne Vice-Chairman.

ELECTRIC LIGHTING AT WEST HAM.

Heavy Deficiency to be Met out of the General Rates.

A serious state of affairs for the ratepayers of West Ham was disclosed at the meeting of the Corporation last Tuesday evening. The accounts for the electric light undertaking for the twelve months ending March 31 showed that the capital expenditure during the year amounted to £83,342; bringing the total outlay up to £268,511. The income was £30,363; but the expenditure exceeded this sum by £3788. There was a credit balance of £1689 carried forward; thus leaving a net deficiency of £2099 to be provided for. In addition to the loss mentioned, the annual payment of £1000 to a reserve fund out of the earnings was suspended. The Borough Treasurer, in his report, stated that the balance at the credit of the reserve fund was only £1740. He was of opinion that, when the finances of the undertaking permitted, contributions to this fund should be resumed, and £1000 per annum regarded as an absolute minimum, especially in view of the fact that the capital expenditure in respect of equipment, which will probably become inoperative before the expiration of the loan, amounts to nearly £150,000. In conclusion, he stated as follows: "It is expected that a considerable increase in the supply will take place during this next financial year. But I would remind you that the capital charges will also be much heavier; and I estimate that the increased revenue will be little more than sufficient to meet the additional charges." It was resolved that the deficiency on the year's working should be made good out of the general rates.

THE PRICE OF GAS AT NOTTINGHAM.

Important Reductions.

As from the 1st ult., the following revised scale of charges for gas came into operation at Nottingham: Gas used for purposes other than power—Consumption under 75,000 cubic feet per quarter, 2s. 6d. per 1000 cubic feet; if 75,000 and under 300,000 cubic feet, 2s. 5d.; if 300,000 and under 1,000,000 cubic feet, 2s. 4d.; if 1,000,000 and under 4,000,000 cubic feet, 2s. 3d.; and if 4,000,000 cubic feet and upwards, 2s. 2d. Gas used for power purposes—Consumption less than 500,000 cubic feet per annum, 1s. 10d. per 1000 feet; for this quantity and upwards, 1s. 6d. per 1000 feet. The foregoing scale of charges does not affect gas supplied through prepayment meters, the charge for which remains as before—viz., 3s. 4d. per 1000 cubic feet—nor does the scale apply to the districts in which special charges for gas are made under statutory powers. It may be of interest to give the prices previously in force, which were as follows: Gas used for purposes other than power—Consumption under 75,000 cubic feet per quarter, 2s. 8d. per 1000 cubic feet; if 75,000 and under 300,000 cubic feet, 2s. 7d.; if 300,000 and under 600,000 cubic feet, 2s. 6d.; if 600,000 and under 1,000,000 cubic feet, 2s. 5d.; if 1,000,000 and under 3,000,000 cubic feet, 2s. 4d.; if 3,000,000 and under 4,000,000 cubic feet, 2s. 3d.; and if 4,000,000 cubic feet and upwards, 2s. 2d. The price of gas used for power purposes was the same that is now in operation.

ILKESTON CORPORATION GAS SUPPLY.

Annual Report.

The report of the Engineer and Manager (Mr. F. C. Humphrys) on the operations of the Ilkeston Corporation Gas Department for the year ended March 31, which was presented to the Council last Tuesday by the Chairman of the Gas Committee (Alderman F. Beardsley), stated that the make of gas was 97,401,000 cubic feet, or an increase of 2,948,000 feet over the previous twelve months. The receipts (gas £11,555, residuals £4718, and miscellaneous £367) were £16,641, as compared with £15,872 (gas £11,840, residuals £3747, and miscellaneous £284). The expenditure was £9882, as against £10,224; and there was thus a balance of £6759, as compared with £5648. After allowing for interest, repayment of loans, sinking fund, &c., the larger balance at the disposal of the Committee would permit of an increased sum being set aside for depreciation, and £1000 being handed over to the general district rate.

Commenting on these results, Mr. Humphrys says that the principal features of the year's working are the smaller sum received for gas, owing to the reduction in the price, 2d. per 1000 cubic feet, being equal to £700 on the year's output. The increased return for residuals is chiefly owing to the fact that the new works are now in full operation, and it is possible to get better results from the coal used, and, in the case of the new sulphate plant, to convert the products into sulphate of ammonia as economically as possible. The ordinary meters in use are 1108; prepayment meters, 1807; prepayment meters with fittings, 771; and cookers, 939. The figures for the previous year were: Ordinary meters, 1090; prepayment meters, 1586; prepayment meters with fittings, 612; and cookers, 830. These figures, he thinks, are interesting as justifying the policy of the department in spending considerable sums on prepayment meters, cookers, and fittings—a policy which was questioned very much at the time. Though the profit for the year is larger, the works, plant, and buildings have been renewed as necessary out of revenue, and are now throughout in a good state of repair and efficiency.

The report was favourably received by the Council.

THE PLYMOUTH GAS COMPANY AND THEIR EMPLOYEES.

Strengthening the Bonds of Union.

The employees of the Plymouth and Stonehouse Gas Company had their annual outing last week. This year visits were paid to Princetown and Tavistock; the excursion being made in waggonettes. One-third of the staff and workpeople went on Tuesday, and the remainder on Wednesday and Thursday; the party on each day numbering, with the wives or sweethearts of the men, about 160. Tuesday unfortunately proved to be a wet day; but Wednesday was finer, and on Thursday the weather was beautiful throughout. Accompanying the party on Tuesday were Mr. J. A. Bellamy, the Chairman of the Company; Mr. T. Greek Wills, a Director; Mr. P. S. Hoyte, the Engineer and Manager; Mr. H. B. Heath, the Secretary; Mr. H. R. Coles, the Manager of the Distribution Department, and others. Dinner was served in a large marquee at Princetown—Mr. BELLAMY presiding. At the conclusion of the repast, a few short speeches were made.

The CHAIRMAN, in proposing the toast of "The Workers of the Company," coupled with the name of Mr. Hoyte, said these outings were started a few years ago in order to give the Directors an opportunity of expressing their thanks for the work done by the employees of the Company. At the end of another year of solid work, he was glad, on behalf of the Board, to testify to the fact that the men, both at the works and in other departments, had carried out their duties in a thoroughly satisfactory manner; and the Directors were grateful for it. The question with them was not one merely of pay, but of establishing and maintaining the good feeling which they felt should always exist between the leaders of the Company and all ranks connected with the works. He believed this good feeling was as strong to-day as ever it had been; and he hoped it would continue to exist. So far as their judgment went, the Directors had done the best they could to contribute to the comfort of the workmen; and he believed their efforts had met with appreciation. The Company's record of progress

had been well maintained during the past twelve months, and was better than in the previous year. No small part of this was due to the workers. In recognition of this fact, the Directors had endeavoured to adjust to the men's satisfaction certain matters which had arisen during the year; and it was their desire to continue this policy. Competition had compelled them to introduce new methods of gas production; and in one sense he regretted it, because it lessened the amount of labour required at the works. On the other hand, the Company had obtained parliamentary powers for the extension of their area of supply outside Plymouth; and by the time they had the supply in the new districts of Crownhill and Plymstock well developed, he hoped the number of workmen would be brought up to the old level, even if it did not exceed it. If this result could be achieved, they were prepared to provide the extended supply without any profit.

Mr. HOYTE, replying to the toast, said it had been his ambition, ever since his appointment, to have a happy and contented set of workmen under his charge. He had worked towards this end; but he could have done very little without the support and approval of the Directors. It was four years ago, almost to the day, since these picnics were initiated; and it was his desire that they might take place annually, so that Directors and workpeople might sit at the same table to exchange views, and he hoped congratulations, upon the work accomplished. During these four years, there had been a regular increase in the sale of gas. Last year it amounted to 7 per cent., which was very large for an undertaking of the size of theirs; and it stood among a dozen gas companies that were foremost in the country for successful working. In the past year there had been large developments and alterations at the works. It was a source of regret to himself, as he knew it was to the Directors, that the plant which had been put down had necessitated a certain reduction in the number of stokers; but as the rate of output was increasing, he hoped that in a couple of years they would be up to at least the number they had last year. He thanked the officials and staff at the works for the manner in which they had carried out their duties, and the assistance they had rendered the Directors and himself in maintaining the high position of the Company.

Mr. J. A. WALTERS, the foreman of the works, proposed a vote of thanks to the Chairman and Directors for again inviting them to the excursion. He spoke with gratitude of the provision made by the Board for old workmen and for the widows of deceased employees.

Mr. W. FORD, on behalf of the engineering department, and Mr. BENDING, representing the outdoor staff, supported the resolution, which was carried with cheers.

The CHAIRMAN, in reply, said the Directors would not be worth their salt if they did not recognize services rendered for thirty or forty years by men in their employ. So long as the present Chairman and Directors were on the Board, and they had a "shot in the locker," sympathetic feeling would continue to be shown towards men who had done good work for the Board, and to the widows of those who had died in the service of the Company.

The drive was afterwards resumed to Tavistock, where tea was provided in a marquee erected in a field adjoining the Tavistock Gas-Works. Mr. A. Francis, the Manager, and Mr. F. Doidge, one of the Directors of the Company, were among those present.

Whitby Water Company.—The half-yearly report of the Whitby Water Company states that, subject to liabilities, there is a disposable balance of £1245. Out of this sum, the Directors recommend the payment of dividends for the half year at the rate of 3½ per cent. per annum on the preference stock, 8½ per cent. on the original shares, and £5 19s. per cent. on the new (1897) shares.

Southport Water Board Finances.—The balance-sheet of the Southport, Birkdale, and West Lancashire Joint Water Board has just been published for the year ended the 31st of March. The precept for last year was £6122, and for the incoming year £8047, in regard to which a precept has been served on Southport and Birkdale for their respective proportions. The revenue of the undertaking has augmented to the extent of about £1200; while the expenses of working have not increased in anything like the same proportion.

Cost of the Cray Water-Works at Cardiff.—From a report prepared by the Borough Engineer of Cardiff on the expenditure on the Cray water scheme, it appears that the original estimated cost was £270,000; whereas the actual outlay up to date has amounted to £402,005. It is calculated that a further sum of £146,695 will be needed to complete the works; while the balance in hand of the money authorized is only £38,994. Under these circumstances, it has been resolved to make application to the Local Government Board for power to raise a further temporary loan, pending the promotion of a Bill for additional borrowing powers.

Stafford Municipal Finances.—The annual abstract of accounts of the Stafford Corporation, which has been published by the Borough Accountant (Mr. G. S. Parker), shows that the total indebtedness of the borough on March 31 was £255,692, or a decrease of £1536 on the year. During the twelve months loans were repaid to the extent of £8536; but two new loans, amounting to £7000, were raised. There is a sum of £6688 standing in the sinking funds to the credit of loans originally amounting to £27,000. Of the remunerative undertakings, it is stated that the markets produced a gross profit of £191, the waterworks of £2907, the gas-works of £12,232, and the electric lighting works of £1547.

Newport (Mon.) Gas Company.—The report and accounts which are to be presented to the half-yearly meeting of the Newport (Mon.) Gas Company to-morrow show that the receipts during the six months amounted to £35,302; while the expenditure was £25,837—leaving a balance of £9465 to go to profit and loss account. This, with the amount brought forward from the last accounts, makes a sum of £12,341 available for distribution; and out of this the Directors recommend the payment of the usual dividend. Since Dec. 31, £2800 has been spent on capital account, making the total expenditure under this head £310,470. The private consumption in the period under review amounted to about 152½ million cubic feet.

METROPOLITAN WATER ARBITRATION.

(*Before the Right Hon. Sir* EDWARD FRY, *Sir* HUGH OWEN, G.C.B., *and Sir* JOHN WOLFE-BARRY, K.C.B.)

Thursday, July 28.

The Court of Arbitration under the Metropolis Water Act, 1902, sat again on the above-named day for the purpose of confirming the various agreements arrived at between the Metropolitan Water Board and the Water Companies for the satisfaction of a part of the awards in water stock in lieu of cash, and to consider the procedure in the case of the New River Company.

New River Company.

Mr. MOULTON, K.C., Mr. FREEMAN, K.C., and Mr. HONORATUS LLOYD, K.C., appeared for the Water Board; Mr. BALFOUR BROWNE, K.C., represented the New River Company.

Sir E. FRY asked what was the position with regard to the valuation of the Clerkenwell Estate and of the excepted properties of the Company. Since the ultimate decision had been given, the Court would be glad to know what steps had been taken to bring about an early settlement of this question, because it was obvious that the final award could not be made until the figure representing the value of these estates had been settled.

Mr. BALFOUR BROWNE said, with regard to the excepted lands, some three weeks ago (they did not have to wait for the House of Lords decision for this) they sent a schedule to the Water Board as to the lands which were to be excepted and were to remain with the Company. As yet he did not think the schedule had been agreed. With regard to the far more important matter of the Clerkenwell Estate, immediately after the decision of the House of Lords the Company gave instructions to a well-known surveyor to value the estate for their purposes. Unfortunately, he had not yet done so—in fact, they were going to see Sir John Hollams on Thursday next with reference to some further instructions. It would certainly not be valued for some time. He understood the Water Board had a valuer of their own who had valued the estate from their point of view; and therefore the Company appointed their surveyor. It was quite possible that, when he had valued, the two surveyors might come to some understanding.

Sir E. FRY: We are very anxious, if possible, as soon as the Long Vacation comes to an end, that we shall be in a position to give our final award, and if these two gentlemen do not agree—and it is very rare for them to do so—we shall have no independent evidence on the point. Therefore we must take a course somewhat of this description: We must give you four or five weeks to tell us whether you have agreed; and if you have not, we shall then probably instruct some gentleman to value the estates independently, and he will be a witness to the Court. I do not mean that by doing this we shall be excluding any other evidence, and that the instructions we give him will determine the mode of valuation. We shall probably instruct him to value as between a willing purchaser and a willing vendor. We shall be open to hear arguments as to whether that is the right mode, and as to whether his valuation is right; but he will be a witness to whose evidence we shall probably attach considerable importance.

Mr. MOULTON said the Board took the directions given by the Court on the 17th of December, and instructed their valuer to value according to them.

Mr. BALFOUR BROWNE said the points specified by the Court were all proper ones; but he did not see how some of them were material. He therefore hoped the Company would be allowed to come and say on any one of them that it was not relevant.

Sir E. FRY: I think the course we shall take will be this: We shall give you five weeks from now to inform us if you have come to an arrangement. If you have, we shall be delighted to hear it. If not, we shall appoint some gentleman to give us that information.

Mr. BALFOUR BROWNE said there was one question which was not referred to the Court—viz., the remuneration to the Directors.

Sir E. FRY said, if necessary, this might stand over.

Mr. MOULTON suggested that the Court should sit again on Tuesday, the 1st of November.

The case was accordingly adjourned till the day named.

West Middlesex Company.

Mr. CUTLER JONES appeared for the Water Board; Mr. GILLETT for the Company.

The original agreement having been handed in,

Sir E. FRY pointed out that the recital was inadequate.

It was agreed that it should be altered accordingly. One or two verbal changes were also agreed to.

Mr. *A. B. Pilling*, Clerk to the Water Board, was called and formally proved the agreement, the issue of the necessary notices, &c.

Lord *Welby*, the Chairman of the Finance Committee of the Board, said it had been his duty to carry out the arrangements under which the Companies agreed to take stock instead of cash for their shares; and they were embodied in the agreement now before the Court. He explained the course followed in the negotiations that had taken place, and said the different steps taken had been agreed upon between the Governor of the Bank of England, the Chairman of the Board, himself, and the Vice-Chairman of the Finance Committee. Every step they took was in consultation with the Governor of the Bank of England, and all the negotiations were conducted through him. In his (witness's) judgment, a fair and reasonable bargain had been made between the two parties. It preserved carefully the interests of the ratepayers, and it was not unfair to the other side.

Sir E. FRY: I think it is necessary that we should make an order in the matter, and I have prepared this form, which I believe will give effect to what we have done:

Whereas we, the undersigned, being the Commissioners constituting the Court of Arbitration under the Metropolis Water Act, 1902, did by our award, bearing date the 21st day of December, 1903, determine that the amount to be paid by the Metropolitan Water Board to the Company of

Proprietors of the West Middlesex Water-Works for the value of the undertaking of the Company should be the sum of £3,524,000; and whereas it has been proved to us that, by an agreement made the 21st day of July, 1904, between the Water Board of the one part and the Company of the other part, it was agreed that the said sum should be discharged partly in water stock; and whereas, on an application made this day to the said Court, after hearing witnesses and the Solicitors for the said Water Board and Company, we saw fit to confirm the said agreement with certain modifications, so that it should stand and be valued in the words and form appearing in the schedule to this our order; and the said modifications were accepted by the said Company and Water Board by their respective Solicitors.

I presume you are both prepared to accept these modifications?

Both Counsel signified their willingness to do so.

Sir E. FRY: I put that in because the agreement contains a provision for rescinding it if the modifications are not accepted:

Now we, the undersigned, acting as such Court as aforesaid, do by this our order confirm the said agreement, with the modifications before mentioned.

Then the modification which you propose to introduce into the recital will be this:

Whereas ten clear days' notice in writing of the meeting of the Board to be held on the 8th day of July, 1904, and of the intention to propose the resolution herein mentioned, was given to every member of the Board, and such notice stated the amount of the water stock to be issued under the proposed agreement; and whereas on the said 8th day of July, 1904, it was resolved, by an absolute majority of the whole number of the Water Board, as follows.

Then you set out the resolution as it stands, and we make the variation already settled in clause 3. A copy of this will appear in the schedule to our order.

Mr. GILLETT made an application that the costs of the agreement should be paid for by the Water Board, and submitted that the award did not deal with the question of costs under such an agreement as that entered into.

Mr. CUTLER JONES said he left the matter entirely in the hands of the Court.

Sir E. FRY: You have had an allowance already in respect to future costs. Further than that, you had an allowance for reinvestment, which you will not be put to. We think, therefore, we ought not to allow any further costs, and each party will bear their own in respect of this application.

Other Companies' Cases.

The cases of the Chelsea, East London, Grand Junction, Kent, Lambeth, and Southwark and Vauxhall Companies were dealt with on similar lines. In the case of the West Middlesex, Grand Junction, Kent, and Southwark and Vauxhall Companies, the costs having been deferred, the question of costs was reserved for future decision in case the Board and the Companies could not agree.

The Compensation Awarded.

The following table shows the amounts of compensation awarded:—

Company.	Award in Cash.	Stock Equivalent accepted in Lieu of Cash.	Water Stock B at 109½	Balance.
	£	£ s. d.	£ s. d.	£ s. d.
W. Middlesex.	3,524,000	3,499,850 0 0	3,832,335 15 0	24,150 0 0
Chelsea . .	3,305,700	3,287,893 0 0	3,600,242 16 8	17,807 0 0
East London .	3,900,000	3,704,404 5 0	4,056,322 13 0	195,595 15 0
Gd. Junction .	3,349,500	3,210,000 0 0	3,514,950 0 0	139,500 0 0
Kent . . .	2,712,000	2,697,800 0 0	2,954,091 0 0	14,200 0 0
Lambeth . .	4,301,000	4,260,000 0 0	4,664,700 0 0	41,000 0 0
South. & Vaux.	3,603,000	3,344,262 2 8	3,661,967 0 8	258,737 17 4
	24,695,200	24,004,209 7 8	26,284,609 5 4	690,990 12 4

DEVONPORT WATER-WORKS ARBITRATION.

Saturday, July 23.

(*Before Mr.* A. J. RAM, K.C., *Umpire.*)

The proceedings in this arbitration were to-day re-opened in London; the further inquiry being necessary, it may be remembered, by the death of the Umpire (Sir Frederick Bramwell) before he had made his award. He was succeeded in this office by Mr. A. J. Ram, K.C. The Arbitrators (Mr. G. H. Hill for the Corporation and Mr. Charles Hawksley for the Company) did not attend.

Mr. BALFOUR BROWNE, K.C., Mr. H. E. DUKE, K.C., M.P., and Mr. CLAVELL SALTER, K.C., appeared for the Company; the Hon. J. D. FITZGERALD, K.C., and Mr. HONORATUS LLOYD, K.C., represented the Corporation.

Mr. BALFOUR BROWNE said he understood the Umpire did not need any further evidence, but only desired Counsel to direct his attention to any point on which they wished to address him with the view of satisfying themselves that he appreciated the various questions at issue. If Mr. Ram had read the whole of the evidence, he did not think he could usefully add anything to it. It was agreed by the late Umpire to state a case for the Superior Court; and, as he understood, this still held good.

Mr. FITZGERALD pointed out that, when Sir Frederick Bramwell was sitting, there were three points suggested on which to state a case, and he (Counsel) did not intend to leave any of them to a lay Umpire. But now that they had a legal Umpire, he was willing to leave the first two points (with reference to back-dividends and 1 per cent. preference), and only ask for a case to be stated upon the question of the Admiralty supply.

Mr. BALFOUR BROWNE agreed that, on the whole, his learned friend was right in narrowing the issue to go up to the Court. With regard to the first point, involving a very large sum of money, he did not think they could help the Umpire very much; but he was going to suggest that Mr. Ram should first draw up a blank award, and then Counsel could point out whether any facts had been overlooked.

The UMPIRE said he would hear anything as to the facts which he ought to find to enable the Court to decide the question of the Admiralty supply. He would then hear any argument on the other points—the back-dividends and the 1 per cent. preference—and should deal with them on the evidence. But he wanted the particulars he had to put in as to the Admiralty supply, and then, if required, he would submit a blank award to see whether he had stated the facts in a way it was desired to have them raised.

Mr. FITZGERALD said the first question which arose was whether the Admiralty were restricted in the user of the water conveyed by a 6 inch pipe to the different departments of the Admiralty within H.M. Dockyard at Plymouth Dock as the same existed in 1793. Counsel proceeded to draw attention to the evidence, from which he argued that the Dockyard included Keyham Yard and Keyham Extension Works, being all under one administration and forming part of the same Dockyard. His contention was that so long as the 6-inch pipe sufficed to supply Keyham and other parts of the Dockyard at Devonport, the Admiralty were not bound to pay any additional sum, and that therefore the £2000 odd which the Admiralty had been paying for the supply of water to Keyham and elsewhere ought not to be taken into consideration in estimating the income of the Company.

Mr. BALFOUR BROWNE maintained that the Act of 1793 contemplated not merely a limitation to the 6-inch pipe, but the places where the water was to be supplied; and that Keyham and other departments under the Dockyard administration which had since come into existence, were not entitled to the statutory supply, which was limited to the Dockyard within "Plymouth Dock" as it existed in 1793.

The UMPIRE stated that his predecessor had asked the Arbitrators to send in their reports, and Mr. Hill had sent in part of his; but he (Mr. Ram) had not seen it, and he had had no conference with the Arbitrators. He was afraid if he had their reports it would cause some delay. Mr. Hawksley would not be ready with his for some time.

Mr. FITZGERALD said that, under these circumstances, he should prefer the Umpire's decision at once.

Mr. BALFOUR BROWNE thought they had enough to deal with without the reports.

After some conversation on other matters,

Mr. BALFOUR BROWNE remarked that, owing to the delay in the arbitration proceedings, there would have to be some adjustment as to what was proper capital expenditure in the interval.

Mr. *H. Francis*, the Company's Engineer, said they had spent about half of the £4000 unexpended capital.

It was arranged that the parties should adjust this matter between them.

Counsel agreed to the Umpire first submitting a blank award; and Mr. RAM said he hoped to have it ready in a week.

DENBIGH WATER ARBITRATION AWARD.

The Company Successful.

The award in the arbitration proceedings between the Denbigh Corporation and the Denbigh Water Company has been made by Sir Hugh Owen, the Umpire. The inquiry, which was promoted by the Corporation, was opened at the Surveyors' Institution on the 18th of May, and the proceedings were reported in the "JOURNAL" on May 31. It had reference to the question as to whether the water supply of the Company was sufficient in quantity and quality for the requirements of the town. Mr. E. K. Burstal was the Arbitrator for the Company; Mr. M. Taylor filling a similar position for the Corporation. The award, which is entirely in favour of the Company, is in the following terms: "That the water which the Company are able and willing to lay on in that part of the borough of Denbigh which is within the limits of the supply of the Company is proper and sufficient for the purposes of the Local Authority. That the purposes for which the water is required are reasonable. That the extent to which the water is required by the Local Authority by their notice to the Company on Dec. 7, 1903, is not reasonable. That the Company are proceeding with the execution of additional works of water supply which there is every reason to believe will, when completed, provide a supply of water of good quality very largely in excess of that which will be sufficient to meet any reasonable demand in connection with the system of sewerage for the borough of Denbigh now in course of construction, or like purposes. That the cost of this reference, including those of the Company, shall be paid by the Local Authority."

Additional Capital for the Gosport Water Company.—The shareholders of the Gosport Water Company, at a special meeting last Wednesday, sanctioned the proposal of the Directors to raise, by debentures and preference shares, £50,000 additional capital to provide new works at Soberton, in the Meon Valley, for a fresh supply of water.

International Gas Exhibition, Earl's Court.—In addition to the firms whose names were given in the "JOURNAL" on the 5th and 12th ult., we are informed that the following have booked space for the forthcoming exhibition at Earl's Court: Messrs. Fletcher, Russell, and Co., Limited; West's Gas Improvement Company, Limited; Joseph Taylor and Co.; W. C. Holmes and Co.; Ferrubron Manufacturing Company, Limited; Rotary Gas-Meter Syndicate, Limited; W. H. Tilley; Premier Boiler Tubes, Limited, and the Settle-Padfield Syndicate; Samuel Cutler and Sons; E. C. Hayward and Co.; Messrs. Wilsons and Mathiesons, Limited; James Milne and Son, Limited; Globe Light, Limited; Julius Moeller; Harris and Pearson; Sheepbridge Coal and Iron Company, Limited; Herbert Hanwell; Automatic Gas-Meter Company; Tourtel Manufacturing Company, Limited; Kirkham, Hulett, and Chandler, Limited; Bryan Donkin and Clench, Limited; Ironmongers' Rope and Twine Company; and Volker Incandescent Mantle, Limited.

ADDITIONAL WATER SUPPLY FOR ILFRACOMBE.

Inauguration of New Works.

Last Wednesday, the new works which have been for some time in progress for giving Ilfracombe an additional supply of water were formally inaugurated by Viscount Ebrington, the Lord Lieutenant of Devonshire, in the presence of a large gathering of visitors, among whom were Lord Clifford of Chudley, General Sir Redvers Buller, G.C.B., and Dr. W. H. Collingridge (the Medical Officer of Health for the City of London). The new supply is drawn entirely from Exmoor Forest, in the neighbourhood of Challacombe, more than ten miles from Ilfracombe—the pipe-line from the intakes to the existing reservoirs, which will be utilized by the new scheme, measuring 13 miles. There are eight intakes, embracing a watershed of upwards of 3000 acres; and around each intake land is enclosed, so as to prevent any direct contamination.

The guests were received by the Chairman of the Ilfracombe Urban District Council (Mr. J. C. Clarke); the inaugural ceremony being performed in the Victoria Pleasure grounds. At the foot of the Capstone Rock, a decorated platform had been erected, and the entrance of Viscount Ebrington and the other guests was the signal for an outburst of applause from the large concourse of spectators. Asked to turn on the water, his Lordship grasped the key set for him; remarking that he complied with great pleasure with the request of the Ilfracombe Council to perform the ceremony. The Surveyor (Mr. O. M. Prowse) then handed him an inscribed silver cup, into which his Lordship turned some water, and drank to the health of the Chairman of the District Council and to the prosperity of the town.

Addressing the visitors, he remarked that the enterprise and public spirit which had led a community of less than 10,000 to embark in an undertaking which involved their laying about 3 yards of pipe-line a-piece, was one deserving of public recognition. This was, he believed, the fourth time in fifty years that the civic fathers of Ilfracombe had had to devote their attention to the question of water supply; and this fact was a striking proof of the growth and popularity of the town. He had little doubt that in 1866, in 1880, and in 1887 the Chairman of the day assured the public that the arrangements then made would be sufficient to last for at least a generation. He had little doubt, too, that these gentlemen were well content to find their predictions falsified by the growth of the town. The motto of Ilfracombe, if he might paraphrase the written words upon the seal, was "Health is Strength—and Ilfracombe is the place to get it." The attention which the District Council had given to water and sanitary schemes seemed to be a token of progressive and enlightened spirit worthy of approval and imitation. He trusted the time would never come when the best men and the best intellects of Ilfracombe would think the service of their town and their fellow-townsmen one that was unworthy of them. Though they had not the old traditions of municipal life which were enjoyed by some of their neighbours, there was no reason why they should not possess a high standard of civic duty, and be their equals in everything but antiquity. He said he could not conclude more fitly than by wishing all prosperity to the town of Ilfracombe; and he added: "May the character of its councillors ever stand as high as the character of its sanitation; may its standard of public life be as high as its death-rate is low; and may its administration be as pure as its water supply, and its increase as abundant. General Sir Redvers Buller also offered a few remarks; concluding by expressing the hope that the undertaking just inaugurated would bring additional prosperity to Ilfracombe.

A largely-attended luncheon took place at the Ilfracombe Hotel—Mr. Clarke presiding. Mr. E. J. Soares, M.P., proposed "Success to to Ilfracombe's new water undertaking;" remarking that the Council had done the right thing in keeping the supply in their own hands. Mr. E. J. Slade King, M.D., the Medical Officer of Health for the town, responded. Replying for "The Visitors," Dr. Collingridge said he had had an opportunity of inspecting the country from which Ilfracombe's water supply was taken, and the works in connection therewith, and he was certainly very strongly of opinion that it would be impossible to find a better, a purer, and a more lasting supply than that which they had from Exmoor. He had heard with surprise from their Chairman that the question of cost had been raised in connection with the undertaking. He should like to say that, from a business point of view, they could make no better investment than by sinking their money in works for providing a pure and ample water supply; and again, as a business man, he must say the cost, to his mind, had been exceedingly small. It was hardly possible to conceive conditions under which they could bring so ample a supply into a town from such a distance for anything like the cost incurred at Ilfracombe. In the course of fifty or sixty years, the supply and the work in connection therewith would be quite paid for, and the people would be in possession of a water undertaking for which they would then have to pay no more—ample for double the population they could reasonably expect.

The London County Council and the Marylebone Electric Lighting Scheme.—At the meeting of the London County Council last Tuesday, it was resolved, on the recommendation of the Finance Committee, that, subject to the provisions of the Money Acts and to the Council's Money Bill of the present session receiving the Royal Assent, the Committee should be authorized at any time up to Oct. 31 next, to invite, open, and (subject to confirmation by the Council) accept tenders for London County bills, not exceeding in the aggregate £1,500,000, and having a currency of not less than three or more than twelve months from the date of the bills, in order to provide the necessary funds for the advance of £1,415,000 to the Marylebone Borough Council in respect of the purchase by them of the electric light undertaking of the Metropolitan Electric Supply Company in the borough.

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The annual meeting of the North British Association of Gas Managers has come and gone. It was the forty-third meeting, which brings out the reflection that the years are rolling over the Association. But, without mental process, this reflection is borne in upon the minds of all who have any lengthened experience of the Association by the manifest change which has come over the *personnel* of the active members. Relying upon memory, I would say that of all the members who took part in Thursday's proceedings not one of them appears in the report of the meeting which was held even at so recent a period as ten years ago. There is no gainsaying the fact that the Association, in the eloquent words with which the report of the Committee every year concludes, is "accomplishing the ends for which it was originated;" but the work is being carried on by new men. This sign of vitality is a matter for which we should be thankful, as we also ought to be for the other circumstance that the old men, though they have elected to stand aside, are, for the most part, happily spared to us. Now, when the government of the Association has fallen into younger hands, it is again matter for thankfulness that the hands into which it has fallen are capable ones. Thursday's was an excellent meeting, as regarded the matter brought forward and the handling of it. Mr. D. Robertson, of Dunoon, made an excellent Chairman. That he knew his place, and could keep it, was evidenced by the way in which he led the members into calm waters over the incident about the resolution of the Committee not to affiliate with the Institution of Gas Engineers, which might have proved troublesome. The Association have resolved to stay out of the Institution. The matter is now at an end, and cannot be re-opened, unless (which is very unlikely) the North British Association should go, hat in hand, and ask admission. The report of the Committee brought out the information that Mr. W. Young, of Peebles, is not in robust health, which all who have the pleasure of being acquainted with him will be exceedingly sorry to learn. It is to be hoped that he will soon be stronger, and be able to give his collected work to the Association. Should not the movement have been wider than this? There was surely an instance in which affiliation might have been useful.

There were three thoughtful papers before the Association. It would be idle to say that the one was more eminent than the other, for all contained matter which was the result of individual research. Being upon different subjects, they did not clash; but it was somewhat of an experiment to build up a programme in which all the items partook of the same character—intense research into working problems. It was probably not intentional that the programme was so constructed; but, whether it was or not, it did not detract at all from the interest which the members took in the various subjects. It is, perhaps, not out of place to say that a short programme of papers, such as this was, is more likely to lead to a successful meeting than a large number, which, to say the least of it, slackens the interest and attendance, because it is known that the papers can be read afterwards. Disappointment was expressed that there should have been so little discussion on the paper by Mr. W. Ewing, of Greenock. But it is a thorny subject, and it is one, also, which is understood of laymen; and a manager giving vent to opinions might hamper himself afterwards.

I do not know that I should here offer any further comment upon this happy gathering than to express the pleasure there was to myself in being present, and in seeing so many managers evincing a a continued interest in the National Association. On all grounds the Association deserves to be supported; and that it is being supported by its members is matter for congratulation.

The Edinburgh and Leith Gas Commissioners on Monday approved of the accounts of the undertaking for the year ending May 15. This they did without remark—all that took place being that the Treasurer (Mr. J. S. Gibb) read the certificates of the Auditor, and the resolution which the Commissioners adopted, allowing and certifying the accounts. The minute of the Finance Committee was to the effect that, having considered the abstract of the accounts, with the relative notes by the Treasurer, and having found the accounts correct, they recommended the Commissioners to allow and certify them; and to set apart for the annuities sinking fund, the mortages sinking fund, and the reserve fund, the minimum contributions authorized—£7000, £9520, and £433—together, £16,953; and to carry forward to the debit of next year's accounts the balance of £4389.

The Works Committee reported that they had remitted to a Committee the motion by Bailie Douglas as to the opening of show-rooms for the sale of gas appliances, which was sent to them by the Commissioners on June 27. Bailie Douglas said he had intimated that he would be absent from the last meeting of the Works Committee, and asked that nothing should be done till his return; but, to his amazement, the Committee selected a certain number of gentlemen for a Sub-Committee to consider the subject, and he noticed that five out of the seven chosen were avowed opponents of the motion he submitted. He thought he was entitled to ask them to consider this question. He had no objection to the gentlemen who had been nominated by the Works Committee. What he objected to was that, if they were to discuss the motion on its merits—and they knew that five of these gentlemen had already declared themselves—there was no hope of the remaining two convincing them. He asked that the subject be sent back to the Works Committee. He also noticed that a report had been issued by the Engineer upon this question; and he would like to know the authority for sending out the report, when a motion of this kind was before the Commission. Mr. Herring might have done it, he had no doubt, in the best interests of the Commission; but, at the same time, there were statements in his report (see *ante*, p. 127) which were really misleading, and he thought that the whole question should be considered by a Committee of the Commission. The Chairman (Provost Mackie, of Leith) assured Bailie Douglas that at the meeting of the

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Works Committee the greatest care was taken to secure a fair representation; and he thought that if the Commissioners did not approve of the report of the Sub-Committee when it was presented, they would just vote against it. Nothing had yet been done. Mr. Maxton repudiated that he was an avowed opponent of the motion. He questioned whether Bailie Douglas would get any other three men on the Commission who were of the same mind as himself, on the subject. Bailie Smith, of Leith, was quite at a loss to know upon what ground Bailie Douglas had made his statement. Bailie Douglas replied that he could only judge by the votes which had already been given. Bailie Bryson, the Convener of the Works Committee, moved the approval of the minute. He thought they should consider the whole question as Commissioners. They had agreed to meet a deputation from the shopkeepers on Oct. 10. There had been a letter forwarded to them, asking the Commissioners to meet the deputation in September; but he could not see how they could do this until they had the facts before them. The shops had been already opened. Sir Andrew M'Donald suggested that Bailie Douglas, as the mover of the motion, should nominate somebody else for the Sub-Committee. They wanted truthful information, and nothing else. Bailie Douglas then nominated other two members, who were added to the Sub-Committee.

Subsequently, Bailie Douglas said he should like his question answered then—whether the Commissioners granted permission to Mr. Herring to issue his memorandum. Mr. Herring said it had been customary for him to inform the Commissioners on the various points of particular interest relative to the business of the Commission, by means of a memorandum—that was to say, conveying to them facts and information of every kind, so that they might be fully informed, and be able to discuss these matters. The memorandum in question was in preparation some time before Bailie Douglas's motion. If they looked at it, they would see that it antedated his motion. He thought he was in no way to blame for issuing the memorandum, when Bailie Douglas was bringing forward a motion on the subject. Bailie Douglas said this would, no doubt, come out in the report of the Sub-Committee; but what he objected to was that a report of this sort should come out in the Press when the Commissioners were dealing with the subject. Mr. Herring knew perfectly well that the question had been simmering in the Commission for three months; and he thought Mr. Herring's memorandum should have been held back until the Commissioners had come to a conclusion on the whole question. The Chairman pointed out that there had been a great deal of correspondence in the Press on the subject, and he thought it was Mr. Herring's duty to take note of that. The more publicity, the better for the Commission. Mr. Hall thought it was understood that Mr. Herring's memorandum was not to be issued to the Press. Mr. Menzies said that, on the contrary, it was stated that there would be no harm in publishing it. He did not know who sent it to the papers; but he was certain that it was not prohibited. Bailie Douglas asked whether he was to take it that it was sent out entirely by Mr. Herring, and not by the Commissioners. The Chairman said it appeared that itwas so. The subject then dropped.

The Town Council of Edinburgh had a long talk on Tuesday over the subject of the disposal of the surplus they have in hand upon their electric light undertaking. Having the city credit behind them, the Electric Lighting Committee have been able to raise money at a rate which, it was stated by the City Treasurer, represented a saving of from £10,000 to £12,000 a year; and, repaying in leisurely fashion during the period of sixty years, they are able to show a highly satisfactory financial position, which is as much to be attributed to the favourable basis upon which the undertaking stands as to its commercial success. For the past year the surplus was, roughly, £24,000. What were they to do with this sum? The newly-elected Convener of the Committee—Mr. Stevenson—considered that, in view of the rapidly increasing capital expenditure of the undertaking, it is necessary to build up a strong reserve fund, which, indeed, the Town Council have, in previous years, acknowledged, having fixed the sum at one-tenth of the capital account. As the capital expenditure is already £845,000, he argued in the Council that the reserve fund should not be less than £80,000. On the other hand, the Treasurer (Mr. Brown) is at this time face to face with an estimated increase in the city expenditure generally of £17,655; and on looking around for means whereby to meet that, he cast his eyes upon the electric light surplus. He did not propose to take the whole of it, for he recognizes that the normal increase of the city rates will cover part of the extra expenditure; but he proposed to appropriate about £10,000 of the surplus. His arguments in support of this proposal were quite ingenuous. The Corporation provide for sinking and reserve funds double what is set apart in Glasgow, Manchester, Liverpool, or Birmingham; the depreciation of their streets, through the breaking up of them for the laying of mains, was a serious thing, and the ratepayers were called upon to pay extra rates on account of that depreciation; it would not be too much for them to ask £1000 or £2000 a year to meet that depreciation, not only from the electric light, but from the gas and water also; and the saving in the cost of borrowing justified them in asking the contribution. Mr. Stevenson pleaded that they should be allowed to get their reserve fund up to its proper maximum—he meant minimum; and then he would meet them on the general question. Thus the Council were led to discuss, not the principle of taking the money for the relief of the rates, but the expediency of doing so this year.

In the course of the discussion, it was argued that the ratepayers having laid the foundation of the success of the undertaking, by raising the capital at a cheap rate, and the great mass of the ratepayers not having benefited one particle from the electric light undertaking—surely an amazing assertion! Why should they not receive a consideration out of the undertaking when it was in prosperity? This speaker, to have been logical, should have reasoned the other way—that the Corporation, having taken up a business which is for the benefit of a few, should see to it that, whatever the few pay should be applied to the extinction of the debt upon the undertaking, so that the ratepayers may not be called upon a second time to provide capital while they are still repaying the first. It was mentioned that renewals

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	STRETFORD	500,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	OLDBURY	300,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	TODMORDEN	500,000
BIRKENHEAD	2,250,000	ST. CATHERINES (2ad Cont)	250,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	YORK (Second Contract)	750,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	ROCHESTER (Second Contract)	500,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	NEWPORT (MON.)	250,000
HALIFAX	1,000,000	YORK	750,000	TOKIO, JAPAN	1,000,000
TORONTO	250,000	ROCHESTER	500,000	PERNAMBUCO (Brazil)	125,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	MALTON	150,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	DULUTH, MINN. (2ad Cont)	300,000
MONTREAL	500,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
TORONTO (Second Contract Remodelled)	2,000,000	LEICESTER	2,000,000	SMETHWICK	500,000
BELLEVILLE	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
OTTAWA (Second Contract)	250,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000	BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000
		ACCRINGTON	500,000	MONTREAL, ONT. (2nd Cont.)	1,800,000
				HAMILTON, ONT.	400,000

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AND, IN ADDITION, 4,000,000 CUBIC FEET DAILY; also Coal-Gas Plants at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND, CALGARY, and WINNIPEG.

are being provided for out of revenue; but this must have been a remark not altogether well founded; for Mr. Stevenson, on the plea that the plant might become inadequate long before it was worn out, suggested that they should obtain parliamentary powers to create a renewal fund in addition to the reserve fund. This, in a sense, "lets the cat out of the bag," for it makes it evident that, in the eyes of the new Convener, the Council have been working their electric light undertaking without sufficient thought for the morrow. In this spirit they resolved, by 28 votes to 17, to make the appopriation proposed by the Treasurer. It is a bad practice everywhere to relieve rates by any adventitious means; and it is just as bad in the case of an electric light undertaking as it is in the case of a gas undertaking—indeed, worse, because corporations who take gas profits for town purposes derive them from a much wider section of the population. The suggestion that public bodies should pay a sum annually for depreciation of the streets will not bear much looking at; for those bodies are assessed for the maintenance of the roads, and they are bound to restore them to the condition they found them in when they broke them up. Any charge for depreciation would therefore be a double assessment.

Gas v. Electricity for Public Lighting at Totnes.—The Totnes Town Council decided last Tuesday to accept the tender of the Gas Company for lighting the streets at the price of £2 8s. per lamp, with 5s. extra for incandescent lamps. The Electric Lighting Company offered to tender for the lighting of the streets in which their cables are laid, and asked the Corporation to receive their tender on this basis. Alderman Hayman said the Highways Committee were unanimously of opinion that they could not consider such a tender, as it would be unfair to the Gas Company to ask them to light the back streets only. The Committee therefore did not think they should have a tender from the Electric Lighting Company until they could undertake the lighting of the whole town. The Council endorsed the action of the Committee.

Serious Result of a Navvies' Riot.—An extraordinary riot took place at the new Barrow Water-Works, at Seathwaite, last week, as the result of which Thomas Dawson, landlord of the New Field Hotel, James Greenhow, barman, and H. K.Todd, Assistant Engineer at the water-works, have been remanded on bail, on a serious charge. It appears that the landlord was under the necessity of turning some men out of the hotel, whereupon they set about wrecking the place. For a time they drew off; but eventually a large crowd returned and renewed the attack. The landlord repeatedly asked them to desist; but his requests were ignored; and though he threatened to shoot them, they persisted in their efforts to force an entrance. In self-defence, the accused then fired upon the gang, each one bringing down a man. Unfortunately, the man whom it is said was shot by Mr. Todd died the following day; and one of the other two is also seriously injured. The charge against Mr. Todd is that of causing the death of John Cavanagh; while the other two men are accused of unlawful wounding.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 29.

Sulphate of Ammonia.

There has been a fair amount of inquiry for sulphate of ammonia, but actual business has been on a very limited scale. Buyers have been endeavouring to get in at a further decline; and they have been able to pick up odd parcels at below current quotations. The larger makers, however, seem inclined to resist the downward movement; and, on the week, prices have been about maintained. The closing quotations are £11 15s. per ton f.o.b. Hull, and £11 17s. 6d. per ton f.o.b. Liverpool and Leith. There has also been good inquiry for forward; but the situation has not materially altered. The firmness of makers precludes important business, so that any orders placed have again been taken speculatively.

Nitrate of Soda.

Nitrate of soda remains firm at 10s. to 10s. 3d. per cwt., according to quality, on spot; and for spring delivery 10s. 3d. per cwt. is now quoted for ordinary quality.

LONDON, *July* 29.

Tar Products.

Markets continue quiet; and prices as a rule have a slightly downward tendency. There is a very considerable weakness in pitch in the Lancashire district; and several parcels are being offered for both prompt and forward delivery at very low prices. London manufacturers are fairly steady in their ideas; while business is reported in Yorkshire over next season to a considerable extent, although at a low price. Dealers are still offering on the Continent at prices considerably under those quoted on the London market; but consumers appear perfectly indifferent at present, and have evidently resolved to defer their purchases until they consider that the lowest figure has been reached. Benzol continues very quiet, and there is no actual business to report, although prices remain unchanged. One or two small parcels of anthracene have been sold for early delivery at prices varying from 1¾d. to 2d. per unit, according to quality; but consumers as a rule appear very well supplied, and seem quite indifferent as to the position of the article. The demand for solvent naphtha continues fairly good, especially for home consumption; and there appears to be rather an improved inquiry for forward delivery. There is nothing fresh to report in carbolic acid, and producers appear fairly well sold to the end of October; but consumers are still endeavouring to depress prices, although dealers in more than one instance have offered 1s. 10½d. for forward delivery, which has been declined, makers as a rule holding for 2s. per gallon. There is very little doing in crystals for early delivery; and consumers appear inclined to hold off the market rather than contract forward just at present. The demand in the North for creosote continues good; 1⅞d. having been declined for a large quantity over the present year. Makers as a rule ask 1½d.; but business is reported at 1 7/16d. to a considerable extent. London

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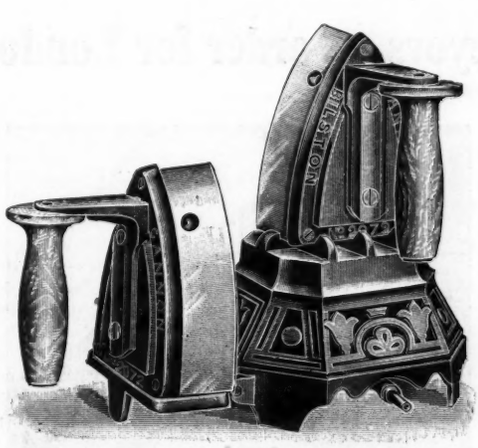

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makers still quote 1⅝d.; but consumers will not pay this price at present, and as a rule do not offer more than 1½d. per gallon.

The average values during the week were: Tar, 17s. to 22s. Pitch, London, 30s. 9d. to 31s.; east coast, 30s.; west coast, 26s. to 27s. Benzol, 90 per cent., 9d.; 50-90 per cent., 7d. Toluol, 6½d. Crude naphtha, 2⅝d. to 3d.; solvent naphtha, 7d. to 8⅛d.; heavy naphtha, 9⅛d. to 10d. Creosote, London, 1½d. to 1 1/16d.; North, 1⅜d. Heavy oils, 2d. to 2⅛d. Carbolic acid, 60 per cent., 1s. 10½d. to 1s. 11d. Refined naphthalene, £5 to £8; salts, 21s. 6d. to 23s. 6d. Anthracene, "A" quality, 1⅜d. to 1⅝d.; "B" quality, 1d., nominal.

Sulphate of Ammonia.

The market is decidedly quiet, and there is an absence of business, which is doubtless caused by the approach of the holidays. Beckton still quote £12 for prompt shipment, but are not offering for forward delivery just at present. The South Metropolitan Company maintain their quotation at £12 2s. 6d., but cannot realize this price, and in all probability will have to accept £12 if they wish to place anything for August-September shipment. Some small sales were made in Hull at £11 13s. 9d. for early delivery, but makers ask £12 15s. for September-October only. In Leith, there does not appear to be any business doing. The nominal value is £11 17s. 6d.; but consumers are not prepared to pay this price for prompt shipment. In Liverpool, some small sales are reported at £11 15s. to £11 17s. 6d.; but transactions are decidedly limited at this port.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The Lancashire coal trade is probably at its lowest ebb. House coal is at a standstill; the holiday season causing temporary stoppages at cotton-mills and engineering and other works in all the large towns. Colliery proprietors have so little demand for coal of all descriptions, that the pits for some time past have been curtailing the output by working only four days a week. The restricted output lessens the amount of slack made to such an extent that it is cleared away as fast as it is made; and in this department of the trade there is some activity, because the demand, if anything, exceeds the supply. Coal-owners, however, do not show any disposition to add to their stocks. There is very little doing in coal for shipping; and the same may be said of coal for gas production. Coke moves off slowly. Quotations are: House coal, 12s. to 14s. best; second qualities, 11s. to 12s.; and inferior sorts, 8s. 6d. to 9s. 6d. and 10s. In some cases a lower figure has been offered and taken. Steam and forge coal remains at 8s. 6d. to 8s. 9d. for better class; ordinary qualities being 8s. to 8s. 3d. For engines the best slack sells readily at the pits at 6s. to 6s. 6d.; medium, 1s. to 1s. 6d. less; and common, from 4s. to 4s. 6d.

Leeds Gas Coal Contracts.

On the subject of the Leeds gas coal contracts, the "Yorkshire Post" says: The anticipation of the Gas Committee of the Leeds Corporation of a reduction in price in their contracts for coal supplies, amounting to 250,000 tons of coal, cobbles, and nuts, has been realized; for we understand that the tenders that have been received for the twelve months beginning with October next show a fall on last year's prices of from 6d. to 8d. per ton. Subject to the approval of the Gas Committee at its next meeting, orders have been agreed upon for 200,000 tons; and should a similar decrease rule the contracts for the remaining 50,000 tons, there will be a saving of between £8000 and £10,000 in the Leeds coal bill for the year. Among colliery proprietors there was at one time a hope that last year's rates for gas coal would be maintained; but keen competition and a quiet market have led to an abandonment of such expectation.

Northern Coal Trade.

There is a dull tone, without very much alteration in the prices quoted; and, generally speaking, the collieries have a little difficulty in working full time. Best Northumbrian steam coals are from 10s. to 10s. 3d. per ton f.o.b., second-class steams are 8s. 9d., and steam smalls are plentiful at from 3s. 9d. to 4s. 3d. In the gas coal trade, there is now an increasing demand. At the same time, it may be said that some of the chief consuming companies take much more in the summer than they did; and thus the increase is not so marked in August, though there is still a desire to obtain stock at the time when the sea-carriage is as low as it now is. No additional contracts for gas coals are reported at present to any large extent. Gas coke is still scarce at the shipping places. Good qualities vary from about 13s. to 13s. 6d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Work has been generally resumed in the pits; but full time is not being obtained at many. Trade is still dull, and can scarcely be said to have recovered from the holidays. Certainly, it shows no sign of improving. The prices quoted are: Main 7s. to 7s. 3d. per ton f.o.b. Glasgow, ell 8s. to 8s. 3d., and splint 8s. 3d. to 8s. 9d. The shipments for the week amounted to 153,030 tons—a decrease of 97,349 tons upon the preceding week, and of 4612 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,157,138 tons—an increase of 178,528 tons upon the same period of last year.

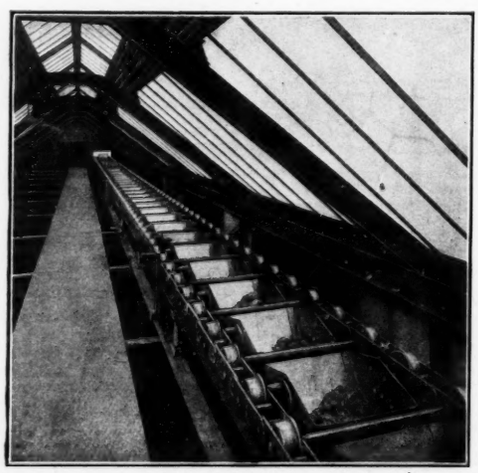
Melbourne Metropolitan Gas Company.—The profits of this Company for the six months to the 30th of June last were £49,000. A dividend of 4s. 6d. per share has been declared for the half year, a sum of £11,000 has been added to the reserve fund, and a balance of £3000 carried forward.

One of Three Conveyors in a London Power House.

Two similar Conveyors on order for London County Council.

Suitable for Handling Coke.

4 Installations in Hand.



Several Plants just Erected Abroad.

NEW CONVEYOR CO., LTD.,

SMETHWICK.

The Depth of Gas-Mains.—The result of a recent inquiry by the Local Government Board for Ireland into an application by a District Council for a loan of £542 for gas-main extensions and new plant, has just been made known. The Board, in granting the loan, say they are satisfied as to the necessity for the proposed works; but they stipulate that the new mains shall be laid at a depth of 2 feet at least below the surface of the streets, instead of 15 inches as proposed.

Water Scheme for the North of Ireland.—At the last monthly meeting of the Portadown and Banbridge Joint Water Board, a resolution was adopted directing the Solicitor to prepare an agreement for the apportionment among the local bodies of the expense to be incurred in providing a new water scheme for the towns named. The Board have provisionally agreed to apply for a loan of £60,000 for carrying out the scheme; and it was resolved to increase this to £65,000, in case extra outlay should be necessary, so as to avoid the expense of a second inquiry.

Explosions in Street-Boxes.—In reply to a question put by Sir Thomas Dewar to the Home Secretary, as to whether his attention had been called to an accident in Regent Street on the 21st ult., occasioned through gas escaping into a telegraph inspection chamber, and coming into contact with leakage in an electric wire, and whether he would state if any explosions arising through leakage of a similar character had been reported by the police during the past two years, Mr. Akers-Douglas said he had been informed by the police that, so far as they were aware, there were within the Metropolitan Police district during the two years ended the 30th of June last 21 explosions of a character similar to that mentioned in the question; and that they had resulted in injury to eleven persons and in the death of two horses. The matter did not appear to be one as to which he had any power.

Littleborough Gas Company.—The Directors of this Company have issued their report for the year ending the 30th of June, 1904. The balance of profit on the revenue account is £1433, against £1388 last year; and there is an available balance of about £2950. The maximum dividend—10 per cent. (less income-tax)—is recommended. The gas sales show a decrease—£3577 against £3818. The reduction in the quantity of gas sold is 6¼ per cent., and it would have been considerably higher but for the increased demand for gas for cooking. The decrease is caused by the mill consumption, which is considerably reduced owing to the adoption of "short time," which has also had its effect on domestic consumption. The incandescent system of lighting has also been adopted in most of the mills, in addition to shops and dwelling-houses, and also by most of the public buildings; and this has had a tendency to still further diminish the consumption. The cost of coal has been reduced from £1649 to £1416. Residuals realized £1050, against £973 last year. The quantity of coal carbonized was 2493 tons, producing 25,220,300 cubic feet, compared with 2791 tons, producing 26,917,000 cubic feet, last year. The make per ton shows an increase —10,116 cubic feet against 9621 cubic feet. During the present half year, about 300 additional cookers have been fixed.

Water Supply of the Rand.—The correspondent of "The Times" at Pretoria, telegraphing last Thursday, said the draft ordinance conferring extended powers on the Rand Water Board passed its second reading that day in the Legislative Council. The object of the ordinance is to consolidate the existing systems of water supply on the Rand, and to improve and cheapen the service. The importance of cheapness will be appreciated from the fact that the present water-rate is 10s. per 1000 gallons, while no provision is made for the ultimate needs of a rapidly-growing community. By the new system, it is expected that the cost to the private consumers will ultimately be reduced to less than 2s. The principle of the Bill is to federate municipalities and mines, who divide between them equally representation on the Board; while in most of its details the measure follows the lines of the London Water Bill. The scheme is expected to entail a preliminary outlay of £2,500,000 for a provision of 10 million gallons of water daily. This sum includes the expropriation of the three Water Companies. Security for the issue of the stock and for the loans to be raised is provided for by means of a dormant rate.

The Windsor Royal Gaslight Company have placed a repeat order with Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, for retort-bench ironwork.

The Wirksworth Urban District Council have sealed an agreement with Mr. Percy Griffith, as Engineer to the Council, for the provision of an additional water supply for the town and district.

Messrs. Kirkham, Hulett, and Chandler, Limited, have received an order for one of their improved patent "Standard" washer-scrubbers, of 500,000 cubic feet capacity per 24 hours, for the Spalding Gas-Works.

The Uxbridge and Hillingdon Gas Company have placed an order with the Chemical Engineering Company and Wilton's Patent Furnace Company for one of their round open saturators for the daily production of 25 cwt. of sulphate.

Messrs. Kirkham, Hulett, and Chandler, Limited, have received an order from the Barnet District Gas and Water Company for patent "Standard" grids, to be fitted in three purifiers—the result of a trial with one purifier having been satisfactory.

Tenders for the issue of 800 ordinary shares, of the East Surrey Water Company, were opened last Thursday, and amounted to 1610 shares, at prices varying from the minimum of £16 per share, to £16 12s. 6d. The average price per share obtained for the issue is £16 7s.; and no allotment was made under £16.

Messrs. Clapham Bros., Limited, of Keighley, have received an order from the Penrith Urban District Council for dry-lute purifiers, with Clapham's patent "Eclipse" rubber joint, valves and connections, structural work, lifting apparatus, and elevator and conveyor; and from the Burgh of Renfrew for a set of annular condensers.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 315.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 14	10½	Alliance & Dublin 10 p.c.	19½–20½	..	5 2 5
100,000	10	"	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	May 12	6½	Bombay, Ltd. . . .	6–6½	..	5 4 0
140,000	5	"	6½	Do. New, £4 paid	4⅝–5¼	..	4 18 11
380,000	Stk.	Feb. 25	12	Brentford Consolidated	242–247	..	4 17 2
300,000	"	"	9	Do. New . . .	182–187	..	4 16 3
50,000	"	"	5	Do. 5 p.c. Pref. .	127–132	..	3 15 9
206,250	"	June 10	4	Do. 4 p.c. Deb. .	102–105	..	3 16 2
220,000	Stk.	Mar. 10	10⅝	Brighton & Hove Orig.	212–217	..	4 19 1
246,320	"	"	7¼	Do. A. Ord. Stk. .	150–155	..	5 0 0
460,000	20	Apl. 14	10	British.	39–40	..	5 0 0
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c. .	116–120	..	5 0 0
165,700	"	"	4½	Do. do. 3½ p.c. .	90–95	..	4 14 9
500,000	10	May 12	7	Buenos Ayres (New) Ltd	10¾–11¼	..	6 4 5
250,000	Stk.	June 29	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
150,000	20	July 14	8½	Cagliari, Ltd. . . .	21–23	..	7 3 6
100,000	10	May 27	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
50,000	50	May 3	6	Do. 6 p.c. 1st Mort.	51–53	..	5 13 2
1,375,000	Stk.	Feb. 25	5⅞	Commercial 4 p.c. Stk.	110–114	..	4 11 3
536,485	"	"	5	Do. 3½ p.c. do.	106–109	..	4 11 9
442,947	"	June 10	3	Do. 3 p.c. Deb. do.	85–87	..	3 9 0
800,000	Stk.	June 10	7	Continental Union, Ltd.	110–115	..	6 1 9
200,000	"	"	7	Do. 7 p.c. Pref.	142–147	..	4 15 3
575,000	Stk.	Feb. 25	5⅛	Crystal Palace Ord. 5 p.c.	118–123	..	4 6 8
60,000	"	"	5	Do. 5 p.c. Pref. .	120–125	..	4 0 0
112,533	"	July 14	5	Do. 5 p.c. Deb. Stk.	133–138	..	3 12 6
486,090	10	July 14	11	European, Ltd. . . .	19–20	..	5 10 0
354,060	10	"	11	Do. £7 10s. paid	13–14	..	5 17 10
15,243,200	Stk.	Feb. 11	4 1/16	Gas-light and Coke — 4 p.c. Ord.	94–96	..	4 11 8
2,600,000	"	"	3½	Gas-light and Coke — 3½ p.c. max.	88–90	..	3 17 9
3,799,735	"	"	4	Gas-light and Coke — 4 p.c. Con. Pref.	108–111	..	3 12 1
4,193,975	"	June 29	3	Gas-light and Coke — 3 p.c. Con. Deb.	88–90	..	3 6 8
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	90–95	..	5 5 3
70,000	10	Apl. 28	11	Hongkong & China, Ltd.	15–16	..	6 17 6
3,800,000	Stk.	May 12	10	Imperial Continental .	202–205	..	4 17 7
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97–99	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	113–118	..	5 1 8
561,000	Stk.	Feb. 25	10	Liverpool United A .	217–218	..	4 11 9
718,100	"	"	7	Do. do. B .	162–164	..	4 5 4
306,083	"	June 29	4	Do. do. Deb. Stk.	106–108	..	3 14 1
75,000	5	June 29	5	Malta & Medn., Ltd. .	4¼–4⅝	..	5 5 3
560,000	100	Apl. 5	5	Met. of — 5 p.c. Deb.	102–105	..	4 15 3
250,000	100	"	4½	Melbourne — 4½ p.c. Deb.	103–102	..	4 8 3
541,920	20	May 27	3½	Monte Video, Ltd. . .	9–10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	106¼–107	..	4 4 1
406,025	Stk.	July 1	3½	Do. 3½ p.c. Deb.	90–92½	..	3 15 8
300,000	Stk.	May 12	8	Oriental, Ltd. . . .	138–143	..	5 11 11
600,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5⅞–6⅛	..	5 12 0
					*Ex div.		

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. ment.
			p.c.	GAS COMPANIES.			—
235,005	Stk.	—	6⅛	Ply'mth & St'house 5 p.c	—	..	—
851,070	10	Apl. 28	7	River Plate Ord. . .	10¾–11¼	..	6 4 5
300,000	Stk.	June 29	4	Do. 4 p.c. Deb. .	93–95	..	4 4 3
250,000	10	Mar. 29	7	San Paulo, Ltd. . . .	10½–11⅛	..	6 1 9
135,000	Stk.	Mar. 10	10	Sheffield A	237–239	..	4 3 8
209,984	"	"	10	Do. B	236–238	..	4 4 0
523,498	"	"	10	Do. C	234–236	..	4 4 9
116,106	Stk.	—	5	Shrewsbury Ord. 5 p.c.	—	..	4 10 11
6,150,000	Stk.	Feb. 11	5⅛	South Met., 4 p.c. Ord.	125–127	..	4 3 11
1,832,700	"	July 14	3	Do. 3 p.c. Deb. . .	87–89	..	3 7 5
380,940	Stk.	May 12	5	Southampton Ord. . .	105–110	..	4 10 11
87,950	"	—	4	Do. 4 p.c. Deb.	—	..	—
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton — A. 5 p.c.	122–125	..	4 16 0
313,020	"	"	4½	Tottenham and Edmonton — B. 3½ p.c.	97–102	..	4 8 3
182,380	10	June 10	8	Tuscan, Ltd.	8¼–8⅝	..	9 2 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	56–58	..	5 2 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	97–102	..	4 18 0
				WATER COMPANIES.			
782,322	Stk.	June 29	12	Chelsea, Ord. . . .	360–370	..	3 4 10
150,000	"	"	5	Do. 5 p.c. Pref. .	157–162	..	4 4 6
160,000	"	"	4½	Do. 4½ p.c. Pref. '75	142–147	..	3 1 3
175,785	"	Mar. 29	4½	Do. 4½ p.c. Deb. .	137–142	..	3 3 5
1,720,560	Stk.	Mar. 23	8	East London, Ord.. .	225–230	..	3 9 7
654,740	"	June 29	4½	Do. 4½ p.c. Deb. .	135–140	..	3 4 4
1,524,288	"	"	3	Do. 3 p.c. Deb. .	91–94	..	3 3 10
700,000	50	June 10	12	Grand Junction — 10 p.c. max..	137–142	..	4 4 6
310,000	Stk.	Mar. 29	4	Grand Junction — 4 p.c. Deb..	122–126	..	3 3 6
708,000	Stk.	Feb. 25	10	Kent	325–335	..	2 19 8
160,000	"	"	7	Do. New, 7 p.c. max..	230–240	..	2 18 4
1,043,800	100	June 29	11	Lambeth, 10 p.c. max..	315–325	–2½	3 7 8
406,200	100	"	8½	Do. 7½ p.c. max..	230–240	–2½	3 10 10
350,000	Stk.	Mar. 29	4	Do. 4 p.c. Deb..	120–125	..	3 4 0
500,000	100	Feb. 25	10	New River, New Shares	310–330	..	3 0 0
1,000,000	Stk.	July 28	4	Do. 4 p.c. Deb..	122–124½	..	3 4 7
902,300	Stk.	June 29	7½	Southwark and Ord. . . .	280–285	..	2 12 6
126,500	100	"	7½	Southwark and 7½ p.c. max.	215–225	..	3 6 7
489,200	Stk.	"	5	Southwark and 5 p.c. Pref. .	145–150	..	3 6 8
1,019,585	"	Mar 29	4	Vauxhall 4 p.c. A Deb.	120–125	..	3 4 8
1,155,066	Stk.	May 27	10	West Middlesex. . . .	300–305	–3	3 5 7
200,000	"	June 10	4½	Do. 4½ p.c. Deb. .	137–142	..	3 3 5
200,000	"	Mar. 10	3	Do. 3 p.c. Deb. .	91–94	..	3 3 10
					*Ex div.		

An interim dividend at the rate of 1s. 6d. per share, free of tax, on the ordinary shares in John Wright and Eagle Range, Limited, has been announced for the six months ending the 30th of June.

Narberth Gas, Coke, and Coal Company, Limited, has been registered with a capital of £2500, in £1 shares, to establish and carry on the business of a gas, coal, and coke company, to light streets, houses, shops, and other public or private buildings in or near Narberth, Pembroke, by means of gas or other illuminant, and to carry on the business of coal merchants, manufacturers, and suppliers of gas and coke, dealers in building materials, lamp bracket, burner, and globe manufacturers, &c.

The Brackley Gas Company have placed an order with Messrs. Ashmore, Benson, Pease, and Co., Limited, for two purifiers.

In reference to the paragraph in last week's issue in which new contracts of the Economical Gas Apparatus Construction Company were alluded to, it was stated that carburetted water-gas plant was to be erected for the Primitiva Gas Company, under instructions from their Consulting Engineers, Messrs. H. E. Jones and Son, of Westminster. Mr. H. E. Jones is the Chairman of the Company; and it is only in that capacity that he serves them. Nor is there any official connection (excepting the one personal to Mr. Jones) between the Company and the firm.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

MANAGER FOR PATENT GAS COMPANY. Haddon's Advertising Offices.
DRAUGHTSMAN. No. 4246.
FOREMAN (DISTRIBUTING DEPARTMENT). No. 4249.
WORKING FOREMAN. No. 4242.
CANVASSER. No. 4245.
RETORT SETTERS. Biggs, Wall, and Co., London.
STOKER. Freshwater Gas-Works.

Situations Wanted.

IRON AND TIN PLATE WORKER. No 4232.
METER INSPECTOR AND COLLECTOR. No. 4235.

Correspondence Classes in Gas Manufacture.

No. 4240.

Plant, &c., Wanted.

STATION METER. Winchester Gas-Works.
TANK TRUCKS. British Cyanides Company.
TAR OR LIQUOR TANK. No. 4239.

Plant, &c., for Sale.

BOOKS: BRITISH ASSOCIATION PROCEEDINGS, REPORTS OF GAS ASSOCIATION, &c. No. 4247.
PURIFIERS. Neston Gas-Works.

Company, &c., Meetings.

BARNET GAS AND WATER COMPANY. Albion Tavern, August 19, at Twelve o'clock.
BROMLEY GAS COMPANY. Bromley, August 9, at Six o'clock.
COMMERCIAL GAS COMPANY. Cannon Street Hotel, August 18, at Twelve o'clock.
CRYSTAL PALACE DISTRICT GAS COMPANY. Albion Tavern, August 12, at Three o'clock.
IRISH ASSOCIATION OF GAS MANAGERS. Armagh, August 16.
NORTH MIDDLESEX GAS COMPANY. Offices, August 24, at 3.30 o'clock.
RIDDINGS GAS COMPANY. London Offices, August 19, at Three o'clock.
SOUTHGATE GAS COMPANY. London Offices, August 25, at 3.45 o'clock.
TOTTENHAM AND EDMONTON GAS COMPANY. Tottenham, August 25, at 3.30 o'clock.

Stocks and Shares.

GENTLEMAN WANTED TO INFLUENCE SALE OF. No. 4218.

TENDERS FOR

Coal.

HAVERFORDWEST TOWN COUNCIL. Tenders by Aug. 19.
HORNCASTLE GAS DEPARTMENT. Tenders by August 8.
SHEFFIELD GAS COMPANY. Tenders by August 16.
STRATFORD GAS DEPARTMENT. Tenders by August 31.

Oxide of Iron.

EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by September 12.

Tar and Ammoniacal Liquor.

HEREFORD GAS DEPARTMENT. Tenders by August 6.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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United Kingdom: One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.
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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

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O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

SPENT OXIDE.

THE South Metropolitan Gas Company are always open to receive OFFERS of SPENT OXIDE.
Chief Office: 709, Old Kent Road, London, S.E.
Telegrams: "METROGAS, LONDON."

SULPHURIC ACID for Sale, specially suitable for making Sulphate of Ammonia.
BROTHERTON AND CO., LTD., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

MELROSE CYCLES and Slot Copper COLLECTORS. Latest Design and lowest Prices. For Cash or gradual payments. Catalogue free.
MELROSE CYCLE COMPANY, COVENTRY.

COAL GAS TAR wanted.
ROBINSON BROTHERS, LIMITED. Works: WEST BROMWICH, KNOTTINGLEY, and SPONDON.

"NUGEPE" CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
For all Tar Joints.
For all Ammonia Joints.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 25 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd., (Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager (for England and Wales)—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

SULPHURIC ACID.

SPECIALLY prepared for the Manu- facture of SULPHATE OF AMMONIA.
SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

COAL GAS TAR wanted.
BEST PRICES GIVEN.
SHARPNESS CHEMICAL COMPANY, LIMITED, Sharpness Docks, GLOS.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.
BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., LTD., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

AMMONIACAL Liquor wanted by JOHN RILEY & SONS, Hapton, near ACCRINGTON.

THE KEITH LIGHT.

OVER 1600 INSTALLATIONS IN DAILY USE.
SEE illustrated advertisement in next week's issue.
JAMES KEITH AND BLACKMAN, CO, LTD., 27, Farringdon Avenue, LONDON, E.C.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

ROBERT DEMPSTER & SONS, Ltd., Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

SITUATION wanted in a Gas Office as METER INSPECTOR and COLLECTOR (Security), or as FITTER. Nine Years' General Experience. Good Testimonials.
Address No. 4235, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

STOKER wanted, used to Engine and Exhauster and Generator Furnace. Wages 23s. per week.
Apply, by letter, to the MANAGER, Gas-Works, Freshwater, ISLE OF WIGHT.

IRON and Tin Plate Worker requires Outdoor Work. Has Tools and Machines for turning out best work at a low price. Used to Gas Apparatus, &
Address No. 4250, care of Mr. King, 11, Bolt Cour FLEET STREET, E.C.

RETORT SETTERS.

WANTED, Experienced, Steady Work men.
Apply, stating Age, Experience, and Wages required, to BIGGS, WALL, & Co., 13, Cross Street, Finsbury Pavement, LONDON.

WANTED, for a large Provincial Gas- Works, a competent DRAUGHTSMAN. Must have had Experience in Gas-Works. Salary according to qualifications.
Apply, by letter, to No. 4246, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Suburban Gas Com- pany, a FOREMAN of the Distributing Department. Must be energetic and capable.
Apply, by letter, with *copies* of not more than Two recent Testimonials, to No. 4249, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REQUIRED for a Patent Gas Com- pany, a MANAGER with sound Commercial Training, capable of developing a New Industry. One with Technical Gas knowledge preferred, but not absolutely necessary.
Apply, stating Age, Experience, and Salary required, to Box 131,018, Haddon's Advertising Offices, Salisbury Square, LONDON, E.C.

GAS MANUFACTURE.

CORRESPONDENCE Classes in above now starting for 1905 Exam. Last Year every student Passed First-Class.
Practical Mathematic Chemistry Classes start Aug. 15.
Address No. 4240, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO Gas Companies' Secretaries, Mana- gers, and others, a LIBERAL COMMISSION is offered to a Gentleman able to influence the sale, by Private Negotiation, of Shares in old-established dividend-paying Gas and Water Companies.
Address No. 4248, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good general Carbonizing WORKING FOREMAN, for Shovel Charging. Good Carbonizer, well acquainted with the general routine of a Gas-Works, including Regenerative Settings, Boiler, Exhauster, and Sulphate Plant. Permanent job for a steady suitable man. Size of Works, 3½ Million cubic feet. Sixty miles from London.
Apply, by letter, stating Age and Wages required, with *copies* of recent Testimonials, to No. 4242, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, a First-Class CANVASSER for a Gas Company in the South of England. Must be well up in all the latest Gas-Fittings, Cookers, and Fires, and must have a good knowledge of costs of Gas and Electricity, &c. Good Salary for a suitable man.
Applications, together with Full Particulars and References, also Salary required, to be addressed to No. 4245, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a small Second-Hand STATION METER, in good condition, capable of passing 6000 to 8000 cubic feet of Gas per hour.
Full Particulars to the GAS-WORKS, WINCHESTER.

WANTED to Purchase, Good Second- Hand TANK TRUCKS, capable of holding 10 Tons of Gas Liquor.
Send Particulars to the BRITISH CYANIDES COMPANY, LIMITED, OLDBURY.

WANTED, a Cast-Iron Rectangular TAR or LIQUOR TANK, about 40 ft. by 10 ft. by 10 ft.
Address No. 4239, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GASHOLDER, 40 ft. diameter by 14 ft. deep, in wrought Tank, with six Columns, trellis Girders, and Suspension Gear. In splendid condition. Nearly new.
New GASHOLDER, 40 ft. diameter by 12 ft. deep, with Steel Standards; also new STEEL TANK to contain same.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

IRISH ASSOCIATION of GAS MANAGERS.

THE

ANNUAL MEETING

Of the Association

WILL BE HELD IN THE

Lynn Hall, Abbey Street, ARMAGH,

ON TUESDAY, AUG. 16, 1904.

The Chair to be taken at 11 a.m. by the President, Mr. JAMES WHIMSTER, Armagh.

Business: Payment of Subscriptions; Report of Committee; Admission of New Members; Affiliation of "Irish Association" with "Institution of Gas Engineers;" Election of Office Bearers; President's Address; Reading of Papers, &c.

LIST OF PAPERS TO BE READ.

(The order subject to re-arrangement.):

1. "Keith's High-Pressure Lighting in Dundalk." By Mr. G. AIRTH, Dundalk.
2. "_____."
3. LECTURE:—"The Carbonization of Coal for the Production of Illuminating Gas." By Professor VIVIAN B. LEWES, Royal Naval College, Greenwich.

On the Invitation of the Directors of the Armagh Gas Company, the Members will dine together at 5 p.m., in the Beresford Arms Hotel.

J. G. TOOMS,
Hon. Secretary.

Gas-Works, Waterford,
July 23, 1904.

FOR SALE—Two 6 feet by 6 feet Puri- FIERS, by Dempster, with two Four-Way Valves. Replaced by larger.
Apply to A. E. ASHLEY, Manager, Gas-Works, NESTON.

TAR Contracts Wanted on the Sliding- Scale or at Fixed Prices.
Managers and Secretaries desirous of selling to best advantage, please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

SECOND-HAND BOOKS FOR SALE.

A GAS Manager's Widow is desirous of disposing of the following BOOKS: "Proceedings of the British Association of Gas Managers," 1863 to 1889 (the volume for 1870 is missing). "Reports of Gas Associations." 1883 to 1899. "Proceedings of the Gas Institute," 1890 to 1900 (the volume for 1895 is missing).
Address offers to No. 4247, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GASHOLDERS AND TANKS FOR SALE.

TWO splendid Double-Lift Gasholders, in Cast-Iron Tanks—40,000 and 60,000 cubic feet Capacity respectively, WILL BE SOLD at a sacrifice to immediate purchasers to save carriage. Now being Dismantled, and could be erected for use for the coming Winter if sold at once.
Full Particulars and Photographs on application to FIRTH BLAKELEY AND CO., Gas Engineers, Thornhill, YORKS.

STRATFORD-UPON-AVON CORPORATION.
(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of 5000 Tons of good screened GAS COAL or NUTS, for delivery during the Twelve Months ending Sept. 30, 1905.
Forms of Tender and other Particulars can be obtained upon application to the Engineer and Manager.
Tenders to be sent in, and will be accepted only on the Forms supplied, not later than Aug. 31, 1904.
The lowest or any Tender not necessarily accepted.

J. S. CRANMER,
Engineer and Manager.

July, 1905.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Gas-Works, Willoughby Lane, Tottenham, on Thursday, the 25th day of August next, at half-past Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1904, to declare a Dividend for the same period, to elect two Directors and an Auditor for the ensuing Year, to consider, and, if so resolved, to increase the remuneration of the Directors, and to transact General Business.
The TRANSFER BOOKS WILL BE CLOSED for the CONSOLIDATED STOCKS from the 11th to the 27th of August, both days inclusive.

By order of the Board,
JAMES RANDALL,
Secretary.

Chief Offices: 639, High Road,
Tottenham, July 29, 1904.

THE Haverfordwest Town Council in- vite TENDERS for the supply of 1400 Tons of double screened GAS COAL and 300 Tons of STEAM COAL of the very best quality, to be delivered at the Haverfordwest Railway Station or at the Gas-Works Quay, Haverfordwest, by water communication in quantities as required by the Gas Manager during the Year commencing September 1st.
Tenders by the 19th of August, 1904.
Forms of Tenders and further Particulars of

R. T. P. WILLIAMS,
Town Clerk.

Haverfordwest.

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Hereford Town Council invite TENDERS for the purchase of 600 Tons of Surplus TAR as produced at the Gas-Works, Hereford, for One Year from Aug. 1, 1904.
Tenders to state price per ton delivered into Purchaser's Railway Tank Waggons at the Gas-Works Siding, Hereford.
The Committee do not bind themselves to accept the highest or any Tender.
Tenders to be sent in addressed to the Chairman, Gas Committee, Hereford, not later than Aug. 6.

WILLIAM PARLBY,
Gas Engineer.

Gas-Works, Hereford,
July 25, 1904.

TENDERS FOR COAL AND CANNEL.

THE Directors of the Sheffield United Gaslight Company invite TENDERS for GAS COAL, NUTS, and CANNEL for delivery during the period ending June 30, 1905. The Tenders to state whether the Coal is screened or unscreened.
Tenders (Forms for which can be obtained on application) must be delivered to the undersigned not later than the first post on Tuesday, the 16th day of Aug.
The Directors reserve the right to take the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

HANBURY THOMAS,
General Manager and Secretary.

Commercial Street, Sheffield,
July 27, 1904.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to re- ceive TENDERS for the supply of about 500 Tons of OXIDE OF IRON suitable for Gas Purification purposes, delivered *ex* Ship, Granton Harbour, free of all charges, or in Railway Waggons, North British or Caledonian Railways, Granton Gas-Works.
Intending Contractors will be required to furnish the Engineer with the fullest Information as regards the material to be supplied, including the percentages of moisture and effective Ferric Hydrate in the mass, as well as the source from which the same is obtained.
Further Particulars may be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, Gas-Works, New Street, Edinburgh.
Tenders to be lodged at or before Ten a.m. on Monday the 12th day of September, 1904, sealed and endorsed "Tender for Oxide of Iron," and addressed to the undersigned.
The Commissioners do not bind themselves to accept the lowest or any Offer.

JAMES M'G. JACK,
Clerk.

25, Waterloo Place,
Edinburgh.

BROMLEY GAS CONSUMERS' COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of this Company will be held at the "Bell" Hotel, Bromley, Kent, on Tuesday, the 9th day of August, 1904, at Six o'clock p.m. precisely, to receive the Report of the Directors, the Balance-Sheet certified by the Auditors, to declare a Dividend, and to transact generally the business of a General Meeting.
A Resolution for the raising of further monies by the creation and issue of Debenture Stock will be submitted at this meeting.
The TRANSFER BOOKS WILL BE CLOSED from the 23rd of July, to the 9th of August, 1904, both days inclusive.

By order of the Board.
HENRY W. AMOS,
Secretary.

Offices: 156, High Street,
Bromley, Kent, July 23, 1904.

CONTRACT FOR GAS COAL.

NOTICE is Hereby Given, that the Urban District Council of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for from 500 to 1500 Tons (Railway weight) of best screened Silkstone GAS COALS and GAS NUTS, to be delivered by the 31st of August, 1905, in such quantities and at such times as the Council may direct. The Coal to be sent in a dry condition free from Hards, Smudge, Dirt, Shale, Pyrites, or other impurities.
Sealed Tenders, marked "Tenders for Gas Coal," to be sent to the Clerk to the Council not later than the 8th of August, 1904.
The Council do not bind themselves to accept the lowest or any Tender.

By order,
H. TWEED,
Clerk to the Council.

6, Lindsey Court,
Horncastle, July 22, 1904.

ROBERT MARSHALL,

CANNEL COAL MERCHANT,

97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, 5, Great Winchester Street, Old Broad Street, London, E.C., on Thursday, the 25th day of August prox., at 3.45 o'clock p.m. precisely, to receive the report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1904, to declare Dividends, to determine the remuneration of the Directors, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 12th to the 25th of August, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Offices, 5, Great Winchester Street,
Old Broad Street, London, E.C., July 28, 1904.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street, London, E.C., on Friday, the 12th day of August, 1904, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and for General Purposes.

Notice is Hereby also Given, that, immediately after the conclusion of the business of the Ordinary Meeting, an EXTRAORDINARY or SPECIAL GENERAL MEETING will be held for the consideration of a scheme enabling the employees holding Ordinary Stock of the Company to elect Directors, pursuant to the provisions of the Crystal Palace District Gas Act, 1904.

The TRANSFER BOOKS WILL BE CLOSED from the 29th day of July until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 25, 1904.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Wednesday, the 24th day of August prox., at half-past Three o'clock p.m., to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1904, to declare Dividends, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 11th to the 24th of August, both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C., July 28, 1904.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 19th day of August, 1904, at Twelve o'clock at noon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th of August, both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, July 29, 1904.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Friday, the 19th day of August, 1904, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 6th to the 19th of August, both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, July 29, 1904.

METROPOLITAN WATER BOARD.

New River Company		4	per cent.	Debenture Stock.		
,,	,,	4	,,	,,	,,	"A"
,,	,,	4	,,	,,	,,	"B"
,,	,,	3	,,	,,	,,	"C"
,,	,,	3	,,	,,	,,	"D"
,,	,,	3	,,	Intercommunication Debenture Stock.		
London Bridge Water-Works Annuities.						

NOTICE is Hereby Given, that, on and after the date hereof, TRANSFERS will be made, and all business relating to the above Debenture Stocks and Annuities will be transacted, at the Offices of the Metropolitan Water Board.

FRED. E. HARRIS,
Registrar of Debenture Stocks.

Temporary Offices, Caxton Hall,
Westminster, S.W., July 25, 1904.

COMMERCIAL GAS COMPANY.

NOTICE is Hereby Given, that an ORDINARY MEETING of the Commercial Gas Company will be holden at the Cannon Street Hotel, in the City of London, on Thursday, the 18th of August, 1904, at Twelve o'clock at noon, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June, 1904, to declare a Dividend, and to authorize the raising of additional Capital.

The STOCK TRANSFER BOOKS WILL BE CLOSED from the 5th to the 18th of August next, both days inclusive, and the Dividends will be paid on the 1st of September next to the holders of Stock registered at the date of the closing.

By order of the Board,
H. D. ELLIS,
Secretary.

Offices: Stepney,
July 27, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

STEAM, OIL, and WATER.

Any Range of Pressure.

ARMSTRONG'S
PATENT
CANDLE SAFETY LAMPS.

Are a great improvement on Oil, giving a good Light, requiring little or no Cleaning, and when once lighted no further attention is necessary. The Candles are made to burn 5, 7 or 9 hours.

48, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

Gas Companies are solicited to try Samples of the

MIRFIELD GAS COAL
UNEQUALLED.
Sperm Value 878·85 lbs. per Ton.

Prices and Analysis on application.

The MIRFIELD (GAS-COAL) COLLIERIES CO.,
RAVENSTHORPE, NEAR DEWSBURY.

THE
"ROTARY"
STATION METER.

Efficiency Demonstrated.

APPLY—
T. G. MARSH,
MAWSON CHAMBERS, DEANSGATE,
MANCHESTER.

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THE CHEMISTRY OF GAS MANUFACTURE:

A Handbook on the Production and Purification of Illuminating Gas.

By W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S.

GENERAL CONTENTS—Raw Materials for Gas Manufacture. Coal Gas. Carburetted Water Gas. Oil Gas. Enriching by Light Oils. Final Details of Manufacture.

"THE BEST WORK OF ITS KIND." — *Journal of Gas Lighting.*

The Second and Final Volume, is in active Preparation and will deal with: The Analysis and Testing of Gas; Photometry; Calorimetry; and the use of Gas for Lighting (with and without the aid of Mantles), Heating, and the generation of Power.

ACETYLENE:

The Principles of its Generation and Use. By F. H. LEEDS, F.I.C., F.C.S., Member of the Society of Public Analysts and of the Acetylene Association, and W. J. ATKINSON BUTTERFIELD, M.A., F.I.C., F.C.S. With Diagrams and Illustrations. 5s. net.

LONDON: CHARLES GRIFFIN & CO., LTD., EXETER STREET, STRAND.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas.
Above the Average in Weight and Quality of Coke.
Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,
CHESTERFIELD.

JOHN HALL & CO.,
STOURBRIDGE,
Manufacturers of
FIRE-BRICKS, LUMPS, TILES,
GAS RETORTS,
And every description of Fire-Clay Goods.

RETORTS CAREFULLY PACKED FOR SHIPMENT.

RAILS.

New and Second-Hand with all Accessories; also Tip Waggons and Turntables.

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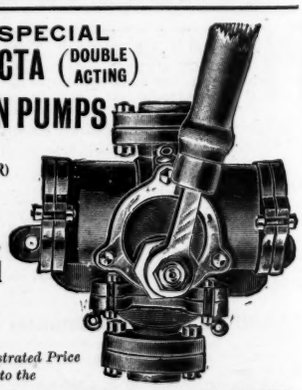
MIDLAND WORKS,
SHEFFIELD.

SPECIAL
PERFECTA (DOUBLE ACTING) PISTON PUMPS
(HAND OR POWER)
FOR
Tar and Ammoniacal Liquor, &c.



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Brettell's Estate
FIRE-CLAY & BRICK WORKS,
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

LONDON OFFICE: R. CULL, 34, OLD BROAD STREET, E.C.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
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NEWBATTLE COLLIERIES,
DALKEITH, N.B.

JAMES OAKES & CO.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,
Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.
NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER,
Gas Engineers' Agents and Contractors for METERS, FIRE-CLAY GOODS, OXIDE OF IRON, AND ALL OTHER GAS APPARATUS.
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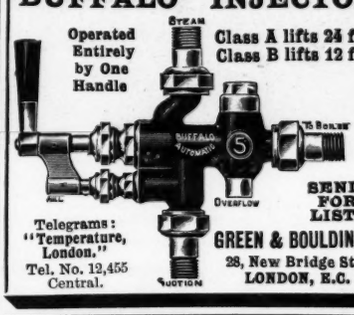

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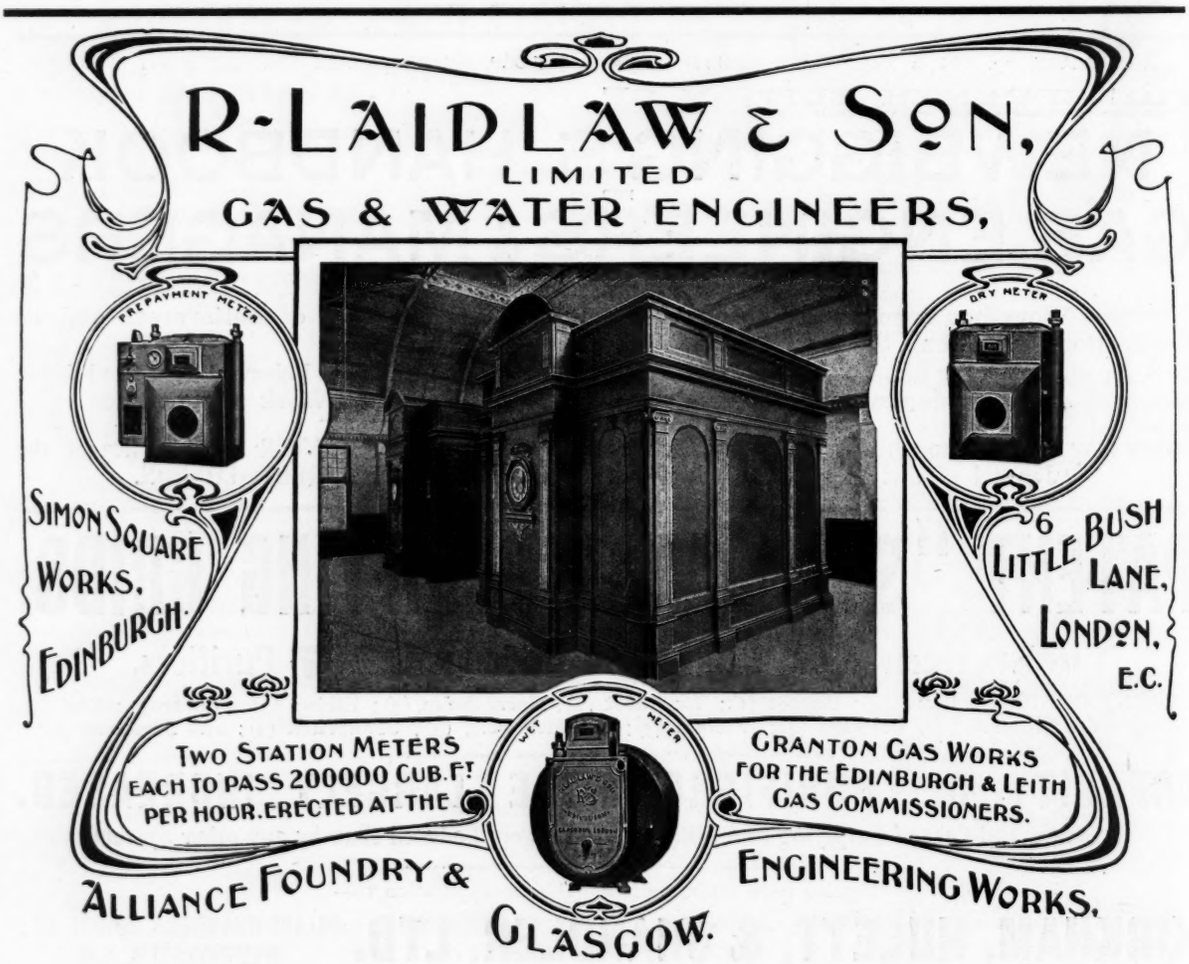
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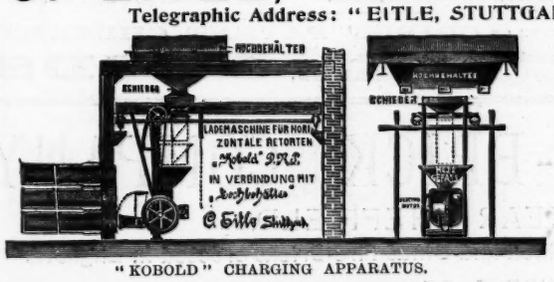

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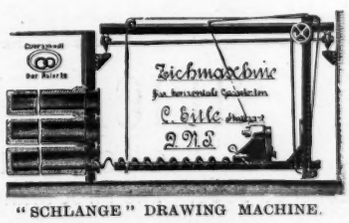

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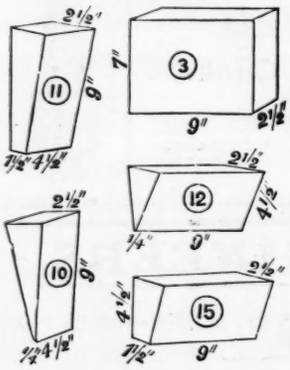

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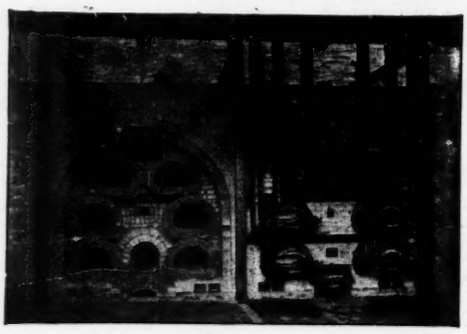

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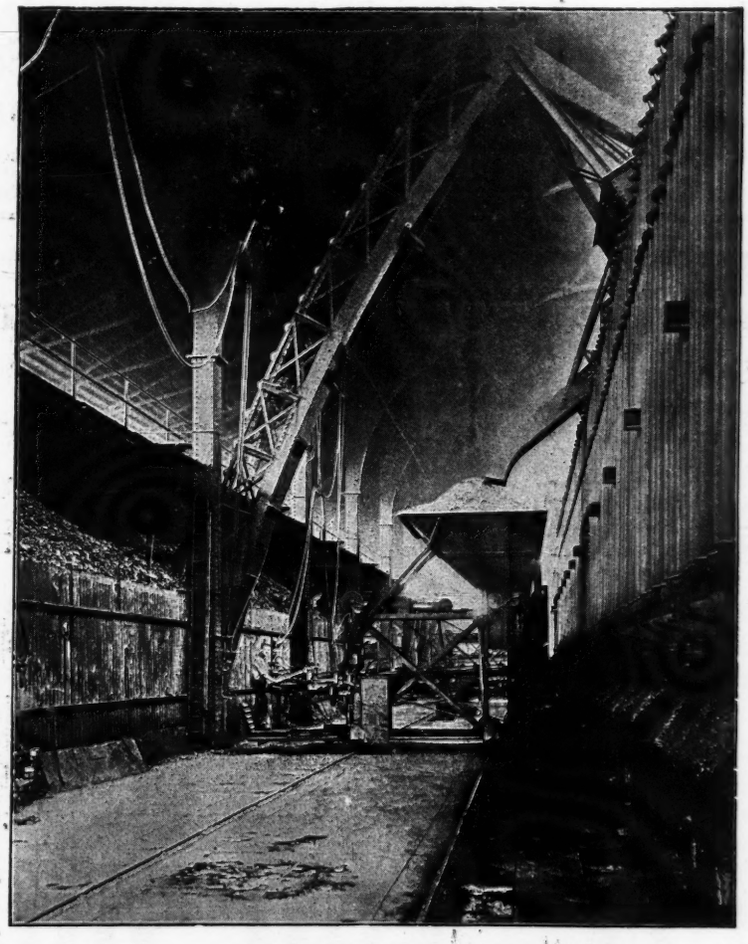

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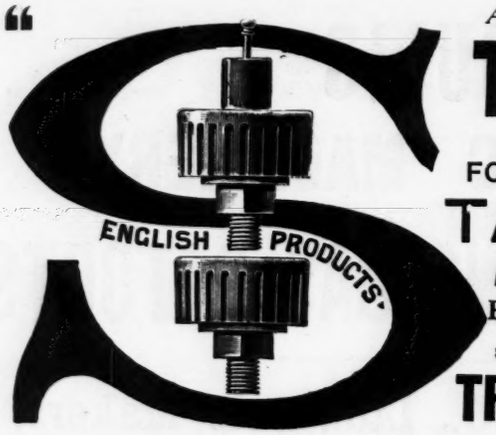

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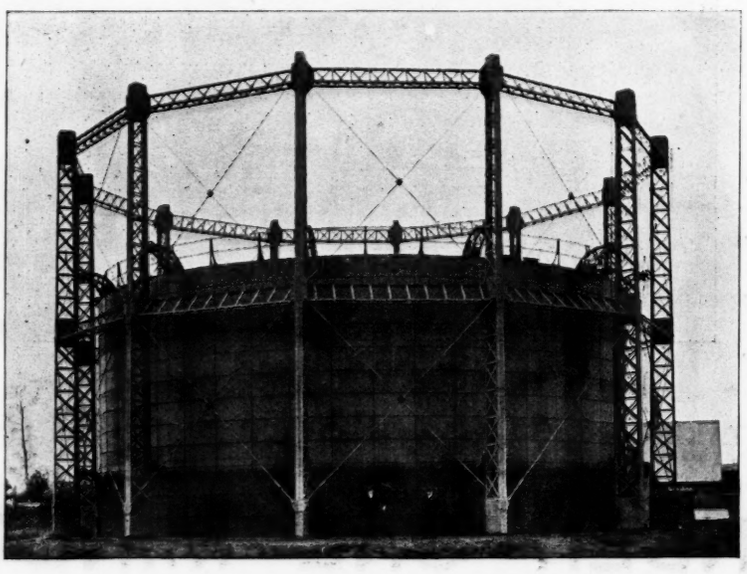

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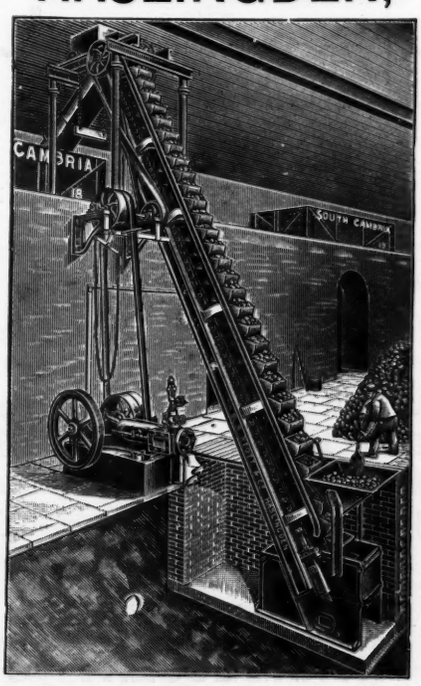

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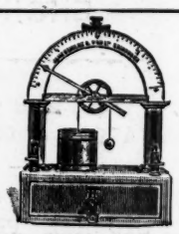

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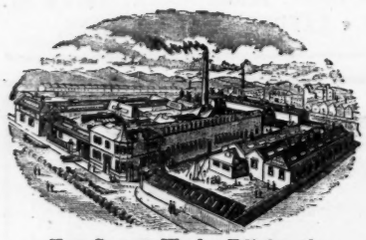

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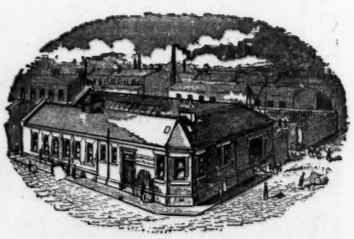

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